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[OFFICIAL NOTICE.]

## Twenty-Sixth Annual Meeting, Western Gas Association.

OFFICE OF THE SECRETARY,
NEW ALBANY, IND., April 7th, 1903.

The annual meeting of the Western Gas Association will be held at the Claypool Hotel, Indianapolis, Ind., May 20, 21, 22, 1903, and will be called to order by its President, Mr. A. H. Barret, of Louisville, Ky., at 10 A.M., Wednesday, May 20.

Announcements as to rates will be made after the opening of the Claypool Hotel—it is entirely new, and has been in the course of construction for 2 years—which will occur between the 15th and 25th of April. Indianapolis is one of the best hotel towns in the country, and within a few blocks of the Claypool Hotel are a number of hotels conducted on the European and American plan, at which rates suitable to all persons can be secured.

The sessions of the Association will be held in a room provided by the Claypool Hotel.

The Executive Committee has arranged for the following papers:

Naphthaline, by Dr. W. H. Birchmore, Brooklyn, N. Y.

Gas and Meters, by Mr. John McIlhenny, Philadelphia, Pa.

The Most Economical Yield per Pound of Coal, by Mr. James Somerville, Indianapolis, Ind.

Increasing the Sale of Gas to Existing Customers, by Mr. B. W. Perkins, South Bend, Ind.

Municipal Ownership, by Mr. A. E. Boardman, New York City.

Heat Conductivity of the Different Clays, by Mr. Wheeler, St. Louis, Mo.

High Pressure Gas Mains Under the Mississippi River at New Orleans, by Mr. Thos. D. Miller, New Orleans, La.

Low Candle Power Gas, by Capt. W. H. White, New York City.

Wrinkle Department, Edited by Mr. W. E. Steinwedell, Cleveland, O.

Reports will be made by the following committees: On Specifications for Gasholders; World's Fair Committee.

Arrangements are being made with the various Passenger Associations to secure the usual 1½ rate for persons attending the convention, full details of which will be given shortly.

The Secretary will be pleased to answer any questions relating to the meeting, and will mail application blanks for membership to applicants. The membership fee is $10, which includes the first year's dues; annual dues $5 thereafter. The Association publishes and distributes, free of charge, to its members the Proceedings of the Association, which alone is worth more than the annual dues.

Yours truly,

JAS. W. DUNBAR, Sec'y.

[OFFICIAL NOTICE.]

## Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE WRINKLE DEPARTMENT,
721 Citizens Building, Cleveland, O.

To the Members of the Western Gas Association: The Wrinkle Department is now ready to receive contributions for the 1903 collection, and I would thank you to please send a sketch or description of any new device or method you may have to the above address.

Any sketch, photograph or drawing, accompanied by a written explanation, of a new idea will be gratefully received, and it is hoped that you will comply promptly by favoring us with a contribution.

Respectfully,

W. E. STEINWEDELL,
Editor Wrinkle Department.


APR 20 1903
SMITHSONIAN DEPOSIT.

## BRIEFLY TOLD.

JUDGE SEAWELL'S SOUND SENSE.—A correspondent forwards the following from San Francisco, Cal., under date of the 10th inst.: "This week Judge Seawell decided that the city cannot compel contractors with the municipality to pay laborers $2 at least, and employ them only 8 hours a day. He reached this decision in the suit of the San Francisco Gas and Electric Company to force the Board of Supervisors to pay $23,886 for light furnished the city for the month ending December 29. The contract with the Company provided that the provisions of the charter as to hours and wages should be observed. The Company paid no attention to this stipulation, and when its bill was presented it was denied payment. Thereupon the Company took the matter into court. In his decision Judge Seawell says: 'The work performed by the Company in manufacturing gas and in generating electricity, or in distributing them to customers, is not work done for the city and county.' The gas and electricity, when produced, become the property of the plaintiff and are then supplied to its various customers, of which the city is only one. Gas and electricity are commodities, as much so as stationery, coal, provisions or any other supplies furnished to the city and county. It would scarcely be claimed that the requirement of the charter under consideration applied to contracts furnishing stationery, and that a contractor furnishing writing paper to the city could not recover the contract price thereof because some persons employed in the manufacture of the paper worked more than 8 hours a day. There is no greater reason for applying the charter provisions to the furnishing of gas and electricity. Even if it could be held that the contract in question is subject to the provision of the charter limiting the hours of labor, it would not follow that the plaintiff could recover for the gas and electricity supplied at the rate fixed by the contract. The charter does not prescribe any penalty for the breach of such provision of the contract. It declares that every contract for work, etc., which does not comply with the provisions of article 2, chapter 3, section 1, shall be void, and any officer signing the same shall be deemed guilty of misfeasance, but if the 8-hour limitation is applicable, the contract is not void. The charter prescribes no penalty for the breach of that provision of the contract and leaves the liability of the contractor and the remedy of the city and county for such breach to be determined by the general principles of law. The complaint alleges that the city has sustained no injury or damages by reason of the fact that some of the plaintiff's employees work longer than 8 hours a day, and if it be also true that the gas and electricity supplied by the plaintiff have been used and consumed by the city, it is also liable for the contract price. My conclusions are: (1) The charter provision which limits the hours of labor applies only to contracts for work to be performed for the city and county; (2) a contract to light the streets and public buildings of the municipality is not a contract for work to be performed for the city and county. Gas and electricity are commodities, and the plaintiff in agreeing to supply and the defendant in agreeing to pay for them, assume the relation of seller and purchaser of personal property; (3) the allegation of the complaint shows the city has sustained no damages which it is entitled to deduct from the contract price of the gas and electricity supplied to and consumed by the city.'"

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NOTES.——

CAPTAIN W. H. WHITE reached home last Tuesday, after an "Oriental trip" that took up something over two months. He looks fine, and he says that he feels as well as he looks. His personal impressions respecting Jerusalem and Jericho are likely to be expressed later on in the session rooms of the Society of Gas Lighting, the halls of the Lotos Club, and elsewhere.

D. F. GUFFY has filed a suit in the Circuit Court for the Marion (Ind.) district to compel the Marion Gas Company to place a gas meter in his house, without his being obliged to make a deposit of $5 with the Company as a guarantee that his accounts with it will be settled according to agreement. The Company has 2,000 meters in use.

MR. HERMAN POTTER has been appointed Superintendent of the plant at Nebraska City, Neb.

THE proprietors of the Athol (Mass.) Gas and Electric Light Company will expend this season quite a sum of money on their electric lighting plant.

THE output of gas for the month of March last, from the municipal plant at Holyoke, Mass., over the corresponding month for 1902, amounted to 14 per cent. The plant would be all the better for some needed extensions.

[OFFICIAL REPORT—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 571.]

## NINETEENTH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

HELD IN THE GRAND HOTEL, CINCINNATI, O., MARCH 18, 19 AND 20, 1903.

### FIRST DAY—MORNING SESSION.

[*Discussion on the paper by Mr. F. W. Stone, Ashtabula, O., on "Natural Gas as a Factor in the Artificial Gas Business."*]

[For the text of Mr. Stone's paper, see *ante*, p. 570.]

The President—Gentlemen, you have heard an extremely valuable paper upon a very interesting subject. I trust all of you will join in a full discussion of the features brought out by the author. I will call on Mr. Persons to open the discussion, as I believe he has had some experience in Toledo regarding the subject.

Mr. Persons—I want to correct our President. My experience has been entirely with artificial gas. I have flirted a little bit possibly with natural gas, but never had any intention of going into the natural gas business. I am not in the business and have no intention of going into it. We have had some experience in Toledo in selling gas appliances where we have had natural gas at 30 cents per 1,000. We have fuel gas there at 70 cents per 1,000. From the fact that natural gas appliances came into more general use, by reason of the utilization of natural gas, we have been able to do quite a large business in selling stoves for artificial gas. We sold a good many and found that they "stayed." Of course, it is fair to say that probably a large majority of our stoves are sold on lines where natural gas had been available, but where it subsequently was taken from that section of the city. We have sold a great many in such districts. Our gas stove business increased something like 40 per cent. last year. It is a pretty hard blow for an artificial company to have natural gas drop on it. You cannot help but feel it at first. From the little experience I have had I am led to believe that we are going to have natural gas throughout this State for a good many years to come. None of us now hope for natural gas to disappear within a very short time, because new fields are being opened, and these new fields have proved to be the best fields that have ever been in the market, so that one must be prepared for a good, long fight if it comes to his town.

Mr. J. T. Lynn, of New York, was called on by the Chair and responded as follows: Mr. President, I have had some experience with natural gas. I am interested in natural gas in Ohio to-day, and in artificial gas as well. Last fall they brought natural gas to northern Ohio into three towns where I was interested. When natural gas was brought into a town in which I was interested I sold out to the natural gas company and left town. I am interested in a natural gas company at Bowling Green, O., a town of about 5,000 people. Last year we sold there 127,000,000 cubic feet of natural gas. I may say that the natural gas business in Ohio to-day is in better condition than it ever was. I do not think we will have natural gas out of Ohio for 25 years to come. I am speaking now not of the smaller places, because I think they are taking on a great many small towns which they will eventually drop off. They have struck the best fields in West Virginia that have ever been struck in the natural gas business, and they are now selling natural gas on a different basis than they have ever done in the past. Ten years, even 5 years ago, everything in Ohio was sold on a mixer basis outside of the city of Toledo, paying $1.50 per mixer, or $2, or whatever the rate might be. To-day everything is on a meter basis and natural gas companies are getting paid for every foot of gas they are furnishing to their consumers, so that natural gas will last very much longer in this way than under the other form. Outside of Chillicothe, Circleville and two or three other smaller towns natural gas in Ohio is now sold altogether by meter. Some of the smaller towns last winter "went cold" a good many days; but by selling the gas on a meter basis the supply will last much longer. I think that natural gas will eventually be of benefit to the artificial gas business in Ohio. I do not think it will benefit the present generation of artificial gas men very much, since I think that natural gas is here to stay for a good many years. In a small town in northern Ohio, where they used natural gas for about 5 years, we bought the plants and built an artificial gas works. During the life of natural gas in this town they sold about 85 millions feet per year. After the artificial plant was erected we sold 9 millions feet, and last year, after 4 years' labor, we were up to 15 or 16 millions feet. My advice to all gas companies is, if they are going to have natural gas competition, to either buy it from the natural gas companies at the city limits and distribute it through their artificial

system, or if possible sell the existing plant to the natural gas company.

Mr. Coombs—I would like to ask Mr. Persons if they have good natural gas service?

Mr. Persons—The best in the world. This winter for about 24 hours the pressure was a little low on account of the temperature, but only for about 24 hours. We got along all right with the exception of about 20 or 24 hours.

Mr. Butterworth—I wish all would talk up louder and more distinctly so that the stenographer can hear what we are saying and properly record the remarks of the various speakers. If we are going to publish our proceedings we want them to be complete and accurate. I do not think the stenographer could possibly hear more than a fourth of what Mr. Lynn was saying. It was all very interesting and would be very valuable for our permanent record. Even we who were sitting near him could scarcely hear what he said. I understand and appreciate that none of us is used to public speaking, but I think we ought to lay aside our natural modesty and timidity and "talk up." (Applause.)

Mr. Coombs—I would like to ask Mr. Persons what inducement he offers to consumers to use artificial gas at 70 cents per 1,000 as against natural gas at 30 cents?

Mr. Persons—(After making some remarks which he directed the stenographer to omit.) When natural gas was first installed they usually, for domestic purposes, installed it in the cheapest way possible; as, for instance, putting in an ordinary perforated burner and a piece of gas pipe, which lost its efficiency in a very short time through beginning to warp out of shape, and to leak. By offering a first-class, modern gas stove you can show about the same results with artificial gas at 70 cents that you can with natural gas at 30 cents for domestic purposes, and by reason of the increased flame temperature of artificial gas over natural gas, and by properly utilizing the other advantages of artificial gas over natural gas, we have been able to accomplish the results referred to. Good soliciting is also an important factor. We tried advertising which did us some good possibly, but our stoves were all sold by personal solicitation; good, hard knocking every day in the year.

Mr. L. T. Palmer, Tonawanda, New York—I would like to ask if anybody here has had any experince in the use of natural gas competing with themselves in the sale of manufactured gas?

Mr. J. W. R. Cline, who was called on by the President to respond to the above inquiry, suggested that you furnish illuminating gas for illuminating purposes and natural gas for fuel purposes. That is the way he disposed of the question at Springfield, O.

Mr. Palmer—At what relative prices?

Mr. Cline—Natural gas at 25 cents yer 1,000 and illuminating gas at $1.25 per 1,000. We have a peculiar ordinance, which provides that natural gas should be sold for fuel or for power purposes only, and we thought in that way we would keep the people from using it for illuminating purposes. We did not altogether accomplish that. Quite a number of consumers use it for both purposes.

Mr. Lynn—I have had some experience in distributing both natural and artificial gas in the city of Detroit. We used to run a natural gas plant and also an artificial gas plant. We tried, as far as possible, as Mr. Cline said, to keep the people from using natural gas for illuminating purposes, and where we found them using it for both purposes we would try to bluff them into paying $1 per 1,000 for the natural gas consumed for illuminating purposes. However, the courts rendered two or three decisions on that subject, to the effect that gas companies cannot control the gas after it passes the meter. After it passes the meter the consumer can use it for whatever purpose he wants, regardless of any contract or anything else we may have with him. It was held to be his gas after it passed the meter. When it passes the meter it is charged to him and he can use it for heating, cooking or illuminating purposes just as he sees fit. While I had charge of the distribution of natural and artificial gas at Detroit, in a quiet way we would vary our pressure in the evening, so that if a person was trying to use natural gas for illuminating purposes he would not be able to get any satisfaction from it at all. He would have a light one minute and the next minute would find himself in darkness. We could do that after dark, because the fuel business was practically shut off. Of course, in cities like Cincinnati, Detroit, Toledo, Cleveland, or any of the larger cities, I think there is a place for the artificial gas, regardless of the supply of natural gas. However, even in these larger cities, their income is going to be cut down and their earnings very materially reduced by the introduction of natural gas. As Mr. Persons explained, 10 years ago, when natural gas was introduced, people using natural gas used it in appliances of a temporary character; as, for instance, in an ordinary cook stove with a gas pipe stuck in for a burner, and so on. They were using natural gas on the same principle that they would burn coal; that is, where you had to heat up the entire stove to make a cup of tea. The gas that is in Ohio to-day is a different gas from the gas we use in Detroit and also the gas that was used in Toledo. The gas from the Findlay district comes from the Trenton rock, having about 1-7 of 1 per cent. of sulphur in it; but the present gas, in the southern and central part of Ohio, comes from the Clinton rock and has scarcely any odor at all about it. You can turn it into your artificial gas mains and use it in that way without any waste at all. It will burn just as nicely as artificial gas.

The President—We would like a word from Mr. Light, of Dayton, who has had quite a long experience with natural gas, and who has been very successful in his management of the situation.

Mr. Light—I do not know very much about natural gas; but I do know when they first talked about bringing it to Dayton, our President and myself had a conference about it, and I remarked that if it were coming to Dayton it was not coming to stay. I said it was unreasonable to suppose that it was going to last forever, and the sooner we had it here the sooner we would get rid of it. The result will be in the end that the people will be educated for our benefit. I think we have arrived at that point now. This winter we have been very busy. Some days we have not had as much natural gas as would cook an egg, and it ran that way from about 10 o'clock in the morning until about 10 o'clock at night. About 10 o'clock at night the pressure began to increase. It would increase until about 6 o'clock in the morning, then it began reducing again and by 10 o'clock it was all gone. It has not affected us as badly as it has the artificial business in some other places. We have been able to hold our own very nicely so far against natural gas. We have gone back but very little. We have shown a gradual increase. It was only for a little while that we were put back, and we have had a very satisfactory gradual increase right along. This winter it has been a very large increase; so much so that it has put us to an extra effort to supply the demand.

The President—We would like to hear from Mr. Ritter, of Detroit, Mich.

Mr. C. S. Ritter—Mr. President, I have had some experience with natural gas in two different places, first at Columbus, O., and then at Detroit, Mich., where I am now located. We shut off natural gas a year ago last August. I have no figures here so as to be able to give you just the relative value of the education which the people got in Detrait by virtue of having used natural gas. I think, however, that Mr. Stone is a little bit optimistic in stating the percentage of consumers he will be able to retain when natural gas fails. We have retained practically all of our power gas to gas engines, but I should say that for other industrial purposes we have lost a great deal. From our experience in Detroit I cannot help feeling that Mr. Stone's estimate is rather high.

Mr. H. H. Osborne, Chicago, being called on by the Chair, said: We have had quite an experience at Chicago regarding natural gas from Indiana. If this meeting were being held in Indiana I would not care to say anything about it, but in Ohio I guess I can say something about the situation without getting "licked." There is quite a falling off in regard to the amount of gas used in furnaces and things of that kind for heating purposes in Chicago since the people have been required to pay for the gas by the meter system. At the time natural gas first came to Chicago, to be used there for general purposes or for domestic use, there was a great deal of it used for heating purposes on a flat rate, offering, for instance, to heat a house of 8 or 10 rooms at a flat rate of say $80 per year. The people, of course, were very generous and possessed of a liberal feeling towards the company, and if the day was warm rather than turn down the gas they would open the windows and still use the supply of gas just the same. We found that tendency with people, generally speaking. They were bound to get the good of it in some way, even if they had to open the window and ventilate the house in order to use the gas. A flat rate for an electric current works out in the same way; but if you put them on the meter system they begin to figure how much they are going to pay and we find that there has been a great falling off in the amount of gas consumed by the meter system as compared to the mixer system. I think the benefit the company gets from it is as great or greater than it was when it used the system of selling it on a flat rate. In reference to the price, if I remember correctly, I think it was about 50 cents per 1,000, and we were then selling artificial gas in some portions of the city—that is where they had a competitor—at about 72 cents. People who have used both gases thought that the artificial gas was better at 72 cents than the other gas at 50 cents per 1,000. They claimed it was more economical. I have talked with a great many people in that district, which was around Hyde Park, in

order to verify this statement, and I ascertained that this was the opinion of many of the consumers. I would like to ask Mr. Stone as to what he is going to do with this immense fluctuation of gas from 16,000,000 down to 2,000,000 feet a day, or whatever it was; I remember the fluctuation was very marked. How is he going to handle that? That is a question which occurred to me. We have found it a very difficult problem in Chicago, even in the present situation. We have two holders and put 5,000,000 in one and 4,500,000 in the other. Sometimes we have them both chuck full and before the day is out we have to hustle like sixty to supply enough artificial gas in there to keep going. I would like to know what he is going to do with this great percentage of fluctuation?

Mr. Stone—To be frank with the gentleman, I will say I do not know. I am at the present time running a natural gas plant, and have not got far enough along with that part of it to worry over the supply of artificial gas in case of emergency. Having run an artificial gas plant and afterwards changed over to a natural gas plant I simply was comparing the two and stating the conditions on which a fuel gas plant would have to be operated. I do not believe there is any system known to gas literature to-day that fully fills the conditions that would be necessary for a fuel gas plant. I do not believe there is any system that is economical enough and which allows you to use everything that you produce, and at the same time will give you the variation in output, that would be necessary for a proper working of it in order to supply all of the demands made under all conditions. I am speaking now with reference to what you might call strictly a fuel gas plant. That is my own personal opinion simply. But I have faith enough in the gas business, and I have faith enough in gas engineers to think that when the demand comes for it a solution for that problem will be worked out. I believe that the gas engineers will find a way to do it. Mr. Ritter stated he thought my estimate of the amount of gas that would be used in case we went back to artificial gas was rather optimistic. Well, I don't think so, and because I qualified the statement by saying that in case the proper appliances were used, and in case the business was handled in the right way, then the estimate which I made would hold; otherwise not. It is foolish for you to try to induce people to use things the use of which will prove very expensive to them; that is, unreasonably expensive. If you do not put in proper appliances, and if you do not fix your distribution system right, you make it expensive for people to use it, and then they talk to their neighbors, saying, "I tried to use gas for cooking," or "I tried to use gas for heating, but it was not any good. I find it costs me too much." I based my estimate on the use of the gas by the installing of proper gas appliances constructed with a view toward the economical use of the gas. I notice, in comparing the figures at Ashtabula with the figures prevailing in some of the other towns using natural gas, that our bills at Ashtabula only average about 60 per cent. as much as some of the older natural gas towns. The average meter bill for domestic consumption in some of the older natural gas towns worried me a little bit. We like to sell as much gas as we can and have the people satisfied with it. I made it a point to take the accounts from two or three towns and analyze them, and I found it was not because we were selling to any more people, or it wasn't because we were not selling them for the same purposes that they were in these other towns, or it was not because the people were not using it so as to accomplish just as much of a result as they were in the other towns, but simply because the people of Ashtabula, prior to the advent of natural gas, had been educated in the use of artificial gas for fuel and had been educated to put in the most economic appliances they could. They had been educated to utilize it in the best manner. They had been educated to be careful of it, and to exercise care and economy in the use of it. That education has been to a certain extent a bad thing for me, because by reason of it I am not selling the quantity of gas per meter that I feel I would like to sell. But, on the other hand, if I should ever have to change back to artificial gas, and sell it again, I really believe that I could still hold at least from one-third to one-half of the business I have now got using natural gas. I have analyzed the accounts and have figured out that these people cannot afford to get along without it. That has been my experience in the town of Ashtabula in the use both of artificial and of natural gas, and the result of my comparison between the two, and my comparison between our experiences in Ashtabula and the experiences in other towns of about the same size, where natural gas is also used.

Mr. John D. McIlhenny, being called on by the President, said: Mr. Chairman, I have had no experience in the natural gas business, but I have had some experience with a gas company where the price of gas has been increased. In a certain town two gas companies were competing with each other and selling gas at 50 cents per 1,000; in some cases a special reduction was allowed under that price. The companies were combined and the price of gas increased to an average of a trifle over 80 cents per 1,000 cubic feet. The first year the company lost a consumption of slightly over 20 per cent, in gross sales; in a little over three years they regained that 20 per cent. and the company is still going ahead, having a very satisfactory increase of business. Is has been said that while competition is very much to be deplored and very bad in many ways, it seems to have an ameliorating feature in that it induces the public to burn gas more freely, and in no other way will they reach that point except by long continued work and persistent effort. It has been shown where gas has been sold at a low price and then increased the consumption has practically been retained for a year or two years' time.

Mr. Lynn—I do not like to speak too often on this subject, but I have had some experience in a small town where I am interested in the gas business, and where the same conditions existed as were referred to by Mr. McIlhenny. We bought out two companies who were competing. They were selling gas as low as 45 cents for fuel and 80 cents for light, and when we consolidated the two interests we increased the price to 80 cents for fuel and $1.25 for light. That was 5 years ago next month. At that time, in a town of 15,000 to 18,000 people, we were sending out 18,000,000 cubic feet. Last year we sold 62,000,000 cubic feet in the same town; but the opposition company, by selling gas at a cheap price, started the sale of gas appliances in that town and educated the people to the use of gas for fuel, both for heating and cooking. When I and my associates purchased these plants I wrote to Mr. McIlhenny, knowing that he had had the same experience in this town that he speaks of, asking him what the decrease was from the increase in price. Our decrease the first year was less than 10 per cent. on the increased price. Of course, in these 5 years we extended the mains very materially and reached a great deal larger consumption and a larger population than we did before. The town I speak of, at the last census, had a population of about 18,000 people, and there are probably 20,000 to 21,000 people there to-day.

The President—Any further remarks on this paper?

Mr. Doherty—One subject I do not want to see passed over. I would like to hear some answer to the question put to Mr. Stone, as to what we are going to do to take care of this enormous variation or fluctuation in demand? I do not believe that you could sell gas for heating purposes only at $1 per $1,000, to take the place of coal for domestic heating, and make it pay.

Mr. Osborne—I think in a city like Chicago, and the circumstances under which they are working, they will be able to make it. It only occurred to me in reference to the smaller towns. They have had natural gas for some time in Chicago, and of course it is dying out to some extent; but they are still getting a supply of it there. Being a large company, and having plenty of money, the company I refer to have been able to and are making all preparations for the occasion when an increased demand will be made upon them. While I do not mean to say that natural gas has not done a great deal for the artificial industry in educating the people in the use of gas—for I believe it has—I simply wanted to find out what these smaller towns are going to do where they have been using artificial and natural gas and where the natural gas has been falling off? I would like to know what they are going to do to take care of this business that the use of natural gas has, in a certain way, worked up for them? Of course, in the larger towns like Chicago or Detroit—I do not know so much about Detroit—I suppose they will take care of themselves all right. Chicago, I am sure, will be able to do it nicely. They are making every preparation for it now, and when the time comes they will be able to supply the increased demand growing out of the education of the people in the use of gas for fuel and cooking purposes. They are getting the benefit now of some of this education, because they are not holding natural gas as cheap as they were formerly. As I stated before, it is metered, and they are getting the benefit of the more economical use of the gas by reason of the meter system. So that the people are becoming educated, as has been stated here several times, and when the time comes they will be able to meet the demand, as every preparation is now being made for that purpose and to that end.

Mr. Persons—I think Mr. Chollar made a statement years ago, at a convention in some paper, that ordinary artificial gas for domestic heating purposes at $1 would be equivalent to coal at $40 per ton.

Mr. Doherty—Fifty-four dollars, I think it was.

Mr. Persons—I think he said $40 per ton.

Mr. Doherty—I did not make my remark quite plain. I meant if you could sell the gas at $1 per 1,000 for heating purposes, I doubt if the

company made money out of it if it only took the place of coal for domestic heating. It is a problem that is I think beyond the engineer. If some one were to give me gas free at atmospheric pressure, I could not afford to distribute it and compress it and sell it in competition with coal at Denver. That is due, not to the low price of coal there but to the peculiar conditions existing at that point. We have about 2 weeks in each year when we have extremely cold weather. The thermometer will go down, we will say, to 20° below zero. As this only happens about 2 weeks in the year, the houses are not built and thoroughly protected against cold as they are in St. Paul, where they have cold weather all the year round. The load factor of our plant in Denver today is about 16⅔ per cent. By load factor I mean we have to have a works and a distributing system—the distributing system is the important part of it—capable of distributing 225,000 feet of gas per hour. Now if we distribute at that rate throughout the entire 365 days of the year, or rather throughout the 8,760 hours of the year, our output of gas would be 6 times what it is. Taking a temperature diagram, and figuring the amount of gas in proportion to the difference of temperature, we would require a works and distributing system 25 times as big as the total amount of gas we would sell, and a large portion of the year it would be lying idle. Now, the lowest cost for gas, of course, will obtain when we can work all of our investment to its full capacity, and if you work it at a less amount of capacity you finally get to that point where the fixed charges eat you up. The solution of the problem I think rests with the system of charging and not with the method of selling gas. When we say we will sell gas at so much per 1,000 cubic feet, and agree to supply the demand no matter what it may be, it would be a good deal like someone coming to this hotel and saying, "I want to engage 100 rooms. I don't want to permit anybody to use those rooms myself, and when I occupy any of those rooms or all of them I will pay you so much per night." What rate could the proprietor afford to give that man? If he occupied one room for one night in the year you would have to charge him like the dickens for that one room that one night to come out even, but if he occupied all of those rooms 365 days of the year you could give him a very low rate. In other words, the rate per room in the illustration, or the rate per 1,000 of gas consumed in our case, is an absolutely inequitable method, and we can never develop our business to its logical possibilities as long as we sell gas on the per 1,000 feet basis any more than in the electrical business if the electrical energy is sold on the basis of so much per kilowatt hour basis. I do not believe to-day 50 per cent. of the electrical companies in the country are still sticking to the per kilowatt hour basis, but they are using differential basis on the load factor of the particular consumer, and I believe we will come to some such basis in the gas business. At first blush a gas man may turn up his nose at such a suggestion, but the more he thinks about it and the more frequently a problem like that is given to him, I think he will finally find that he is selling something besides gas, that he is selling a convenience, and that when he gets a consumer he is giving him the freedom to use a portion of the investment which is costing the company money all the time, and the company must get a return on that portion of the investment regardless of how much gas the consumer may burn.

### Anent the Question Box.

The President—We have here now at the desk the Question Box in printed form, as edited by Mr. Henry L. Doherty. Copies of it will be distributed to the members of the Association as soon as we adjourn, and the names will be checked off so that we can keep track of them. Mr. Doherty, I understand, has some announcement to make in regard to the Question Box.

Mr. Doherty—The box contains 160 questions. All of them have not been answered, but a great many of them have; 73 engineers and managers throughout the country have contributed to it. Now it is impossible to take up all of these questions and discuss them on the floor of the convention, the idea being that this would simply be a contribution to gas literature. A portion of the questions, however, can and shonld be discussed. The question is how to determine which ones will be discussed. I, therefore, make the suggestion that each member interested look through the Question Box during the noon adjournment and then this afternoon nominate such questions as he would like to have discussed here in the order of preference. Then, by a little clerical work, we can ascertain which questions a majority of the members desire discussed. As I said there are about 160 questions and about 73 gas engineers and managers have contributed to the printed discussions. The book contains 150 odd pages, and some of the questions you will find very interesting. If you will get the printed report now and look through it during the adjournment, then nominate which questions you desire discussed and the order in which you desire them discussed, by passing slips to the Secretary, denoting your choice, we can determine which ones you want to hear discussed and which ones have the preference.

On motion of Mr. Lynn, duly seconded, a vote of thanks was tendered to Mr. F. W. Stone for his very valuable and interesting paper.

On motion the Association then adjourned until 2 P.M.

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### First Day.—Afternoon Session.

The Association reconvened, pursuant to adjournment. Having called the meeting to order the President said: We will take up this afternoon the

QUESTION BOX,

of which Mr. Henry L. Doherty is Editor. You were requested before the noon adjournment to look over the printed list of questions and to indicate to Mr. Doherty those you would like to have discussed. Those who have a list of questions made out which they desire to have discussed will please hand the list to Mr. Doherty at once so that we can proceed.

Mr. Doherty—If any member desires any particular question discussed I wish he would get his nomination of questions in the order of preference into my hands as soon as possible. While the members are making their nominations, I will read the introduction, which is as follows:

The value of any Association of this character must be measured by the services it can render its members. While attempting to advance our business methods it is surely not inconsistent to endeavor to advance our Association methods. It is reasonable to suppose that the members of this Association will keenly appreciate that information which they most desire. Can any committee or officers of an Association predetermine what will be most prized by all of their members? I think not. Some expression must be obtained individually from the members. This can best be done by means of the Question Box. The idea is not a new one, but I think the officers of this Association have put the Question Box on a higher plane and have elaborated its scope far beyond the comprehension of the original proposer's ideas. This plan, if carried to its logical conclusion, will make the annual conventions of this Association an exchange market for ideas and a clearing house of knowledge.

The benefits of co-operation increase faster than the arithmetical increase in the number of partiicpants, and the greatest good will result from the grestest degree of co-operation. Within the limits of our own membership we may not find the best solutions to the problems which confront our members, but in our efforts to solve the problems we meet we must certainly benefit some of those outside of our membership limit, and this should be sufficient warrant to look beyond our membership for co-operation and assistance, and I think we will not seek this help in vain. The fraternal ties between gas managers are due to more rational causes than Association membership.

The offering to this convention does not equal my expectations, although the number of questions asked far exceeded my calculations. It has been found impossible to supply the information requested for many reasons. The time was short, the plan not well understood, and, much to my regret, I have been unable to secure the co-operation of many able gas engineers fully able to supply the information wanted with but slight inconvenience to themselves.

Is the tendency towards a less strict observance of professional ethics? I think not. I hope not.

The future of the gas business—the very existence of our Associations—depends upon the willingness of gas managers to give freely of their stock of knowledge. I hope the Question Box idea will be tried another year, and we will again ask the members of the gas fraternity for assistance, and when they see how earnest we are, and how unselfishly we use the information thus secured, I am sure we will not ask for their assistance in vain.

I cannot refrain from commenting upon the points brought out by this treatment of the Question Box. Numerous problems of primary importance are not generally understood, and my reason for saying they are not generally understood is because all gas managers and gas engineers do not agree in their views. Recognizing this condition, I very naturally found myself planning some method for its remedy, and after careful thought have come to the conclusion that we should establish a department for research and investigation work, and this matter will be treated by separate recommendations to your Association.

A slip was sent out asking for general information as follows:

1. Each company is requested to describe its method of mapping main, showing symbols used to designate sizes of mains, drips, specials, etc. The object of this is to evolve some standard method which can eventually be adopted by all companies.

2. What disposition do you make of your coke breeze!

3. Each company is asked to make a list of all purposes for which gas is used in its town, and if possible to give the amount of gas used for each purpose. The object of this inquiry is to open up generally new uses for gas where such use may now be confined to only one or a few towns.

4. What sizes of coke do you prepare for the market, and by what names do you designate these sizes? The object of this inquiry is to recommend some standard sizes and provide standard nomenclature for their designation. It is also believed that the coke market can be advantageously cultivated if standard sizes of coke are prepared, thus enabling stove manufacturers to properly design their stoves for the standard sizes.

5. Let each company describe the method used for scurfing retorts, with data regarding frequency of scurfiing and time required.

6. What special forms of furnace grates or stokers are used for burning breeze, and what is their fuel value in comparison with good steam coal?

7. What paint do you paint your holders with, and why do you prefer it?

Very few responses were received. None of the companies in this Association seem to use the same system for mapping mains. I cannot see but conditions are so nearly the same that all companies could advantageously use the same system There must be some one best system, or some best system can be evolved from the present systems in use; but I found this matter to be beyond the scope of this department. I will make a separate recommendation that the Association take up this matter with the idea of evolving some uniform system of mapping mains which can be eventually adopted by all companies.

Few replies were received regarding the disposition of coke breeze. It is pretty generally used as a fuel, but I did not get sufficient information on this matter to make any recommendations. Coke breeze is burned under the boilers for steam raising, but I could not ascertain what results were obtained from its use. Some companies use a steam jet blower and an ordinary grate. Other companies find it possible to burn their coke breeze with a natural draught and a fishbone grate. The Milwaukee Company is burning its breeze successfully with a patent hollow grate bar. The Denver company burns its breeze under its boilers, using an American underfeed stoker. The Detroit company uses its coke breeze in the water gas machine and apparently to better advantage than would result from its use under the boilers. A scoop of proper design is inserted in the charging door of the water gas machine and by revolving this scoop the breeze is deposited around the edge of the fuel bed. This drives the blast to the center, and it apparently increases the capacity of the machine without any bad results whatever, and the breeze fed to the generators seems to have the same value as good coarse coke.

Question No. 3 of the general information brought out the following uses for gas:

Gas engines,
Ladle furnaces,
Confectioners' boilers,
Bakers' friers,
Coffee roasters,
Brazing furnaces,
Crucible furnaces,
Annealing furnaces,
Enameling ovens,
Drug stills,
Beer vat driers,
Hard oil melters.
Tailors gas irons,
Meat boilers,
Multiple burners,
Gas water heaters,
Gas grates,
Laundry stoves,
Heating type metal,
Curling irons,
Cigar branding machines,
Linotype machines,
Banana ripeners,
Singeing machines,
Shampoo driers,
Corset bust block heaters,
Heating incubators,
Hotel broilers,
Water urns,
Embossing leather,
Heating wax,
Bakers,
Heating rivets,
Vulcanizing rubber,
Welding,
Heating glue,
Smelting,
Babbitt metal melters,
Keg branding,
Candy making,
Soldering iron furnaces,
Gas forges,
Assay furnaces,
Steretoyping metal melters,
Drying ovens,
China kiln,
Water stills,
Gas laundry mangles,
Plaiting and crimping rolls,
Rendering kettles,
Dental furnaces,
Gas ranges,
Backus heaters,
Clothes driers,
Portable heaters,
Barbers' kettles,
Glue pots,
Shoe burnishing machines,
Soda fountains,
Can soldering machines,
Hat shapers,
Peanut roasters,
Cloth sprayers' skirt mfg.
Heating steam tables,
Coffee urns,
Heating irons for polishing leather,
Oyster cookers,
Enameling and jappanning,
Heating metal plates,
Resweating tobacco,
Heating branding irons,
Laboratories,
Heating tools,
Melting brass and babbitt,
Water heating,
Blow pipes,
Case hardening furnace,
Cigar lighters,
Cake griddles,
Chafing dish,
Forge for rod heating,
Hot steaming press,
Hair drier,
Oven furnace,
Photography burnishing,
Sealing wax heaters,
Ventilating burner,
Willow chair singer,
Tire setting,
Heating glass moulds,
Tempering,
Band shrinking furnace,
Carbonizing furnace for carbonizing electric burners,
Capsule making,
Dry hot air baths,
Gas machine for hulling beans,
Hot air lamps,
Muffle furnace,
Pure food mfg.
Steam boilers,
Toasters,
Vehicle tire setting.

I think this is a branch which should in the future be covered by the Progress Editor's report, and, therefore, I request all readers of this information to look over this list and add to it any uses for gas which are omitted, sending such omissions to the Progress Editor.

This Question Box department will often develop subjects which are entirely too broad to be properly considered as a portion of the Question Box, and where such subjects are uncovered I think it the duty of the Editor of this department to recommend these subjects to the special consideration of the Association. Question No. 4 is of this character. No uniformity now prevails regarding the sizes of coke prepared for the market, and no standard nomenclature has been evolved to designate these sizes even were they uniform. I will treat this matter by an independent recommendation to the Association.

Questions 5 and 7 did not bring out any information which is worth commenting upon.

I want to acknowledge my thanks to the following people who have assisted me in this work: Mr. Frank W. Frueauff, Secretary; Mr. Irvin Butterworth, President, and Mr. W. A. Baehr, Superintendent gas department, all of the Denver (Col.) Gas and Electric Company, Denver, Col.; Mr. Alfred E. Forstall, of New York, and Mr. Walton Forstall, of Philadelphia, for references furnished; Miss Harriet E. Billings, Assistant Secretary of the National Electric Light Association, whose zeal and industry made a former effort of this sort a success for the National Electric Light Association, and to whom I am indebted for some of the methods used in the work for the Ohio Gas Light Association.

I also want to commend to the appreciation of this Association and acknowledge my personal indebtedness to those unselfish gas managers and engineers who have generously contributed to this work and whose liberality has made this department possible.

If this contribution to gas literature finds value in the eyes of the gas fraternity, I hope their appreciation will be manifested by their future support. The expenses, work and worry are dedicated to the progress, co-operation and advancement of the gas business, the gas fraternity and gas engineering science.

Mr. Doherty—I suggest, Mr. President, that the discussion of these questions be left until I can get the vote from the various members and tabulate it. Gentlemen, if you do not want to vote on a number of questions, then vote on any particular one you are interested in, and as you send them in to the desk I will tabulate them and from those lists I will try to find out what questions are the most interesting and which questions secure the most votes and the discussion can then proceed in the order of preference.

The President—While waiting for the members to vote upon the Question Box, we will take up the

## PROGRESS DEPARTMENT,

as edited by Mr. Irvin Butterworth:

To the Members of the Ohio Gas Light Association—Gentlemen: In accordance with the recommendation of your President for last year, that one of our members be designated to prepare, for presentation at this meeting, a summary of the progress and improvements that have been made in the gas business during the past 5 years, I was duly appointed to undertake such task, and herewith respectfully submit my report, which, while necessarily meager in its treatment of many important matters, and doubtless omitting others altogether (so extensive was the ground to be covered), I have still endeavored to make as nearly complete as the limits of a report suitable for this occasion would seem to permit. It will be obvious, however, that but scant justice can be done to my subject, under the circumstances; but if this feature of your Association work is to be continued, these reports will hereafter cover only the previous year's progress, and should therefore be much more easily made satisfactory. In order to lighten the work of my successor I take the liberty to here request all gas apparatus manufacturers and others who read this report to advise your Progress Editor for the com-

ing year of any misstatements or omissions which they may discover in this report, in order that he may correct same, as no one man can, without such assistance, prepare a complete and correct report.

The following *resumé* will prove a source of encouragement to any who feel that progress has been slow and invention indolent during the recent history of the gas business. There has been more or less advancement all along the line, touching practically every detail of the business, the aggregate effect of which has been to greatly increase the practical efficiency of our plants and methods.

My treatment of this subject will be confined to the practical and mechanical features of gas manufacture, distribution and consumption, not touching upon business conditions and policies or commercial results.

## Appliances.

*Gas Engines.*—Undoubtedly the greatest progress that has been made in the gas business during the past five years has been in the direction of the development and use of the gas engine.

When using coal gas the best modern large gas engines will consume only about 15 feet of gas per hour per horse power as against about 20 feet five years ago; while when using producer gas a horse power per hour can now be obtained from one pound of coal, or less than one-half the quantity employed by the best steam engines, and as high as 34 per cent. of the theoretical heat value of the fuel can now be transmitted as power to the engine shaft. The regulation of gas engines has been improved to such a degree that a cyclic variation of $\frac{1}{3\frac{1}{3}0}$ is now obtainable, easily permitting the operation by them of alternating current generators of medium frequency in parallel, something that has not heretofore been possible. This has been accomplished:

(1) By varying the quantity of the explosive mixture in proportion to the changes of load without changing its strength per unit volume and without decreasing the number of charges per unit of time, instead of, as heretofore, simply varying the number of explosions in proportion to the changes of load; and

(2) By substituting for the old-fashioned single-acting cylinder two or three, or even more, cylinders, set eccentric, then making the cylinders double-acting, so that the engine shaft now receives much more frequent impulses than fermerly.

Electric igniters have been substituted for the hot-air tube, permitting more exact and economical timing of the moment of ignition.

Compressed air is now used for starting the engines, removing a former difficulty, and large gas engines are now being built for lean gases, such as producer and blast furnace gases. Their dependableness has been increased to such a degree that recently a 150-horse power gas engine was operated at nearly full load, night and day, for 138 days without once stopping. According to our last census the number of gas engines in use in the United States in 1900 was 14,884, although this return is probably far from complete; while according to the same authority the aggregate horse power of these engines was 143,850, being 1,500 per cent. more than in 1890, this being the largest increase shown in the use of any prime mover. But the most astonishing increase has been in the size of the engines. In 1893 visitors at the World's Columbian Exposition in Chicago were impressed with the 35-horse power gas engine there exhibited. At the World's Fair, Paris, in 1900, a 1,000-horse power gas engine seemed a monster, but within the past 2 years sizes have been increased to as high as 4,000-horse power, and the British Westinghouse Company is now building, at Manchester, England, 15,000-horse power 2-cylinder gas engines.[1] America seems to be lagging behind Europe in the matter of the number of large gas engines in use, only 25 per cent. being placed to our credit, although we have built as large as any that are in use thus far (4,000-horse power), and one American firm has recently taken contracts to build 16 gas engines of 2,000-horse power each. In Europe the use of large gas engines with producer gas for operating factories has increased enormously within the past 2 years, one firm having made 32 engines averaging 1,390-horse power, none of them less than 200-horse power. The present tendency is toward the horizontal type of engine, but Mr. Herbert A. Humphrey, who is a student of this subject, predicts that the vertical type will finally prevail, especially for central station work. Although most of these large engines are used as stated with producer gas, yet 280-horse power gas engines are used in this country with ordinary illuminating gas. Mr. Humphrey says: "The recent remarkable progress in large gas engines will undoubtedly continue until Sir Frederick Bramwell's prophecy of 21 years ago has been fulfilled and steam engines will only be found in museums."

*Gas Ranges.*—I have no statistics showing the increase in the use of gas ranges during the past 5 years, but it is a matter of common knowledge that their use is increasing enormously. I estimate that there are now about 1,500,000 gas ranges in use in the United States. This is on the basis of one to every twenty inhabitants in the cities and towns supplied with gas.

While no one improvement of a radical nature has been made in gas range construction during the past 5 years, yet many minor improvements have been made that have greatly increased their efficiency, durability, adaptability, appearance and convenience. Among these many improvements are the following:

(1) The bodies (sides, backs and fronts) were formerly made of common sheet steel; now they are made of blue polished and planished steel, which does not burn or chip off.

(2) The ovens are larger than formerly and are now made in standard sizes, conforming to standard sizes of tinware.

(3) Heavy castings were formerly used for bottom and top oven plates, which had to be heated before any cooking could be done; now oven linings are made of two sheets of metal with an air space between them, the outer plates being further reinforced with asbestos, thus reducing radiation, and by these means, and by properly ventilating the ovens (which was not formerly done), and a proper handling of the products of combustion, it now requires, according to one authority, only from 3½ to 5 feet of gas to heat the ovens to a baking temperature as against 18 feet to 24 feet a few years ago.

(4) Ranges formerly rested directly upon the floor; most of them are now supported by short legs so that the floor underneath can be kept clean and is protected from charring, while others are provided with a sub-base that prevents charring and the accumulation of dirt.

(5) The old fashioned sawed or slot burners that were subject to warping and stoppages have been for the most part, replaced by drilled burners, the top burners being generally star-shaped, thus bringing the heat nearer the center of the cooking vessel, reducing to a minimum the cold center under same and forcing the heat to pass over the greatest possible area of the bottom of the vessel.

(6) Top burners are now more economically located with reference to their distance from the bottom of the cooking vessel, and the top of the stove is left more open for the rapid escape of the products of combustion, thus preventing the smothering and imperfect combustion that formerly sometimes occurred.

(7) Top burners are now made in one piece, preventing leakages and allowing the unobstructed passage of the gas, and each burner is easily removable separately without unscrewing any bolts.

(8) Formerly in order to repair or replace an oven lining the entire stove had to be practically dismounted, but now the sides, ends, tops and bottoms of ovens are made by dies instead of by hand, rendering them interchangeable, so that the oven linings can be easily and quickly removed and replaced without disturbing the body of the stove.

(9) Valves operated by wheels or knobs have given way, for the most part, to lever-cock valves which always indicate at a glance whether they are open or shut, and which can be easily tightened when loose by turning a screw.

(10) Burner orifices are now much more easily adjusted than formerly to different gases and pressures.

(11) There have been many minor improvements; such as less fancy-work, wooden valve handles, drip pans so made that fluids spilled or boiling over will not run down the sides of the stove, wire instead of cast iron oven racks, gas supply pipe extra heavy, giving more threads for gas cocks, etc.

(12) Ranges formerly carried first class freight rates; now they carry only third or fifth class rates, meaning a large saving to the gas companies.

Progress has also been made in large baking ovens, especially as to their capacity, one having recently been installed in Boston that is 18 feet long, 11½ feet wide and 5 feet deep, having a capacity of baking 32,000 1-pound loaves of bread every 24 hours, at an estimated cost for gas of 1-10 of a cent per loaf.

*Gas Heaters.*—There have been, during the past 5 years, no improvements in portable artificial gas heaters worth mentioning, essentially the same types and designs having been used throughout the period. There have been some improvements in natural gas heaters, but as they contemplate the use of large quantities of cheap gas they need not be considered here. Several years ago one enterprising firm brought out a large hot air gas furnace for heating entire houses from the cellar, but as it cost about 2½ times as much to heat a house with it as to heat it with coal, notwithstanding it is said to utilize 80 per cent. of the heat units of the gas, its use has not become extensive. The same firm has since gotten out a large water heater adapted to house heating which is said to give good results. In Milwaukee, Mr. Walker has devised and put into use a gas furnace for heating houses with hot water that serves the purpose very satisfactorily during cool fall and spring weather, and that should have even a greater field in more Southern cities.

*Independent Water Heaters.*—Considerable improvement has been made in the construction of water heaters during the past 5 years, resulting in a great increase in their efficiency and general satisfactoriness.

1. This is an error, due to the use of two many ciphers in the authority consulted The engines referred to are only 1,500-horse power.

The water heater attachment to gas ranges of former times, which was very uneconomical, has given way entirely to the independent heater, and these are now made lighter in weight, with thin and contracted water passages, rendering them very efficient and practically instantaneous. Illustrating the improvement that has been made in them, one firm reports that the heater they formerly made required 83 minutes to do the work that their present heater accomplishes under similar conditions in 40 minutes. Five years ago water heaters were constructed with tight casings and burners, so that in order to get at the coil or burner it was necessary to disconnect the heater from the boiler. Now they are so constructed that the entire casing can be easily and quickly removed for the cleaning or repairing of the coils and burners without disconnecting either the water or the gas connections. Some manufacturers are avoiding the leakages and stoppages due to multiplicity of small water pipes with numerous joints by using instead cast iron sections of various forms placed one above another; and one is employing a spiral form of water chamber for accomplishing the same purpose. In fact, there is at present great activity of invention looking to the improvement of water heaters, and one firm boasts a flue gas temperature of only 240°, indicating, under proper conditions, a high efficiency.

*Instantaneous Water Heaters.*—There has been some progress made in the development of instantaneous water heaters, chiefly in making them of different sizes for different purposes and in so constructing them that the water comes in actual contact with the products of combustion, increasing their efficiency to the extent that the water absorbs as high as 90 per cent. of the heat of the gas. One heater turns out 3 gallons of water per minute, raised 50° in temperature, with a consumption of from 2 to 2½ feet of gas. But the use of these heaters seems to be as yet somewhat limited, possibly partly on account of their necessarily high price. The independent water heater business seems to be growing much more rapidly. A concern employing 100 men now turns out, according to their own statement, the bulk of the instantaneous water heaters that are used in this country, but as they employed only from 10 to 20 men 4 years ago, the growth of their business is evidently very considerable.

*Industrial Fuel Gas Appliances.*—Much progress has been made during the past 5 years in devising and perfecting numerous fuel gas appliances for industrial purposes and in developing the use of same, but the limits of this paper preclude an enumeration of them in detail. Perhaps an idea can best be obtained of the progress that has been made in this direction from an examination of the following list of purposes to which artificial gas is now being applied more or less extensively in this country, for hardly any of which it was used 5 years ago:

Babbit metal melters,
Ladle furnaces,
Keg and other branding,
Gas forges,
Brazing furnaces,
Assay furnaces,
Crucible furnaces,
Water stills,
Drug stills,
Annealing furnaces,
Hot-soda fountains,
Can soldering machines,
Singeing machines,
Hat shapers,
Shampoo driers,
Corset bust-block heaters,
Clothes sprayers,
Heating incubators,
Polishing leather,
Embossing leather,
Resweating tobacco,
Vulcanizing rubber,
Welding,
Heating glue,
Heating tools,
Smelting,
Tire setting (vehicle and locomotive),
Heating glass moulds,
Tempering,
Beer vat driers,
Gas laundry mangles,
Pleating and crimping rolls.
Hard oil melters,
Rendering kettles,
Dental furnaces,
Multiple burners,
Clothes driers,
Cigar branding machines,
Shoe burnishing machines,
Band shrinking,
Case hardening,
Carbonizing electric burners,
Capsule making,
Chafing dishes,
Dry hot-air baths,
Rod heating,
Hulling beans,
Hot-air lamps,
Hair driers,
Muffle furnaces,
Pure food manufacture,
Burnishing photographs,
Night lunch wagons,
Photographic plate driers,
Stamping names in hats,
Heating wax,
Heating rivets,
Heating metal plates.

Of course special appliances have been devised for using gas for each of these purposes. The Milwaukee Gas Company has probably donemore in this direction than any other Company in the country. The paper[1] of Mr. Walker, read at the meeting of the Wisconsin Gas Association last month, gives an inkling of the cultivation that has been given the use gas for industrial purposes. They are now able, for instance, to melt brass cheaper with gas than with coal, and have devised furnaces for such purposes that consume as much as 420 feet of gas per hour.

The progress that has been made in the use of gas for fuel purposes is well shown in the fact that many gas companies in this country are now selling, during the year, quite as much gas for fuel purposes as for illuminating purposes.

1 See JOURNAL, March 30, p. 488.

LAMPS, BURNERS, ETC.

*Welsbach Burners.*—There have been no radical improvements in the Welsbach burner itself, but many minor ones, such as:

(1) Improvement in the adjustable check originally brought out in 1897.

(2) The invention of a new check by which a needle-valve is operated by means of a milled screwhead at the side of the burner base. A ball-check burner has also recently been put upon the market.

(3) The strengthening of the gallery.

(4) The shortening of the Bunsen tube, improving the appearance of the burner.

(5) The devising of a single burner that is adapted to any standard mantle, any kind of gas fixture, any design of glassware, any pressure of gas, and for use, if desired, with open-flame gas globes.

(6) The designing of porch burners capable of withstanding draughts.

There has also been devised a ball joint that makes the fixtures always hang plumb. Improvements have also been made in anti-vibrator attachments and in pilot lights, the newest pilot light being said to consume less than one foot of gas per 24 hours.

*Incandescent Mantles.*—While there have been some improvements in the manufacture of gas mantles during the five years, none of them have been of a radical or important nature, except possibly the carrier or cap attachment invented several years ago and now so perfected that any consumer, however unskillful, can easily place and adjust his mantle on his burner, and which also protects the mantle from breakage in shipment and handling. One manufacturer makes a central support for mantles, claimed to conduce to their longevity; another has adopted a new stitch that is claimed to do the same thing. The larger manufacturers are turning out mantles much more uniform in quality than formerly, and the greenish cast of light originally emitted by them has been overcome, the light now being of a pleasing quality. The best mantles now give a light of about 21 or 22 candles per foot of gas at ordinary pressure, which shows no perceptible improvement in this respect during the period under consideration. Mantles are now made in much larger variety than formerly for a greater variety of purposes, the latest catalogue of one manufacturer displaying 26 different kinds of mantles. The price of good mantles has not been materially cheapened in this country but their use has increased enormously, at the rate, according to one authority, of three millions per year during the past five years, until now it is estimated that thirty millions per year are manufactured and used in this country.

*Arc Gas Lamps.*—There have been great improvements in incandescent gas burners, particularly in the recent development of the so-called "arc" gas lamps and in the still more recent high-pressure and self-intensifying gas lamps. Of the former there are said to have been 130,000 manufactured and put into use by one firm alone in this country during the past two or three years. In fact, the development of the "arc" gas lamp is considered by many gas men to be the most important step in the progress of the gas business during the past three or four years. By this means alone the gas companies in some cities have virtually been able to maintain their prosperity. When first made, about four years ago, these lamps were simply two, four or more ordinary Welsbach burners grouped under one shade, or in one globe, but separated quite a distance apart on short arms of a pendant; now they are clustered very compactly together so that the mantles are in close proximity to each other, thereby emitting a light that justifies their name of "arc." They are now so made that all of the burners, or all but one of them, as may be desired, can be turned off by a by-pass arrangement. Their appearance and design have been greatly improved during the past year or two, and a large number of firms are now engaged in their manufacture, the advertisements of not less than 15 appearing in the technical journals of this country. Means for lighting these lamps by electricity have been so improved that this system of illuminating large stores is now perfectly satisfactory. As originally constructed it was a difficult matter to clean and repair these lamps; now no chimneys are employed in the ordinary construction, and the mantles can be renewed and the globe cleaned without removing it.

*Self-Intensifying and High Pressure Lamps.*—Although these lamps have not as yet cut much of a figure commercially, yet their possibilities, or rather their probabilities, are so great that their development, which has all been within the past few years, is a matter of great interest and importance to us. Their chief development thus far has been in England, where high pressure lamps using Welsbach burners consuming gas at high pressure are being used to some extent for street lighting and other

purposes. At the outset this high pressure gas was produced by mean outside of the lamp itself, but now lamps are being so made, as in the case of the Scott-Snell lamp, as to utilize the heat of the products of combustion for this purpose. The means for doing this are as yet cumbersome and noisy, consisting virtually of a miniature hot air engine, militating against the rapid introduction of the lamps; but as the efficiency of the lamps under proper conditions is as high as 50 candles per foot of gas, inventive genius and industry, which are now very active along these lines, will probably soon bring them to a commercial success. A considerable number of these lamps are even now in use in New York and other cities of this country. There is also a type of lamp, such as the Lucas, which is made self-intensifying by means of an extremely long chimney, in some cases 4 feet long, that increases the draught and thereby intensifies the heat of the flame. These lamps are being vigorously and industriously experimented with, and doubtless a commercial article will ultimately be evolved from them. At present they are quite unsightly. There is also at present a revival of former efforts to perfect devices for mechanically mixing gas and air, in the known and exact proportions, before bringing the mixture to the burners, thereby greatly increasing the light per foot of gas consumed.

That during the past 5 years gas lamps have come into use that have increased the light-giving duty of a foot of gas from, say, 20 candles to 50 candles, is a most significant and inspiring fact in its bearing upon the future of the gas business.

*Incandescent Gas Street Lighting.*—Incandescent gas street lighting has made great progress during the past 5 years, especially during the early part of this period, and it is still coming more and more into favor, gradually making headway against electric street lighting and regaining to gas much of this business that it had previously lost. Berlin, with its 32,000 Welsbach street lights, is now said to be the best lighted city in Europe. The growth of this system of street lighting is shown in the fact that in Boston and vicinity there are now in use about 15,000 incandescent street lamps, in Greater New York and vicinity 20,000, in St. Louis 13,000, in San Francisco 5,000, etc.; and nearly all of the smaller cities and towns of the country have many of them in use. The city of Liverpool owns an electric light plant and buys what gas it uses from a private company, and yet the chairman of its lighting committee, replying to a question asked in open council, recently said that the committee did not intend to extend electric lighting in the streets, as they had found that incandescent gas was quite as good and much cheaper. The improvements in the lamps themselves during the past 5 years consist chiefly in the adoption of a more symmetrical and ornamental boulevard lamp with only two uprights, thus minimizing shadows, and having an iridescent dome that tends to reflect the light down upon the street, and improved ventilating arrangements, rendering the lamp wind, dust and insect proof. More of the bottom of the lamp is now being made of glass, lessening the shadows in the vicinity of the post. The burner itself has also been improved, as well as the pilot light arrangement. A clockwork device has also been invented for automatically turning out each lamp at any desired time.

*Self Lighting and Electric Gas Lighting Devices.*—There have been no noteworthy improvements in these devices, although some progress has been made. Chemical self lighters, such as the platinum sponge pellet, have not proven commercially successful. Successful installations of electric gas lighting attachments for large stores and for single lights are, of course, in use in considerable number; but on account of their relative expensiveness, unsightliness and unreliability, people who want self lighting lights generally use electricity.

*Gas Globes.*—Five years ago holophane globes were looked upon more or less as a scientific curosity, the advantages and utility of which were not at first apparent to the average gas man. A leading gas journal at that time published the following prediction with reference to them: "Some day the public will awake to their real value and wonder at their long delay in doing so." This prediction has been verified, for we see them by thousands in every city, the finest gas lighting effects being produced by them. The monthly sales of holophane globes in this country are now said to be 10 times what they were 3 years ago. The last catalogue of the Holophane Company illustrates 56 different designs of globes, embracing 95 different sizes, of which only a dozen were made 5 years ago. The improvements have been as follows:

(1) The weight of the glass and its liability to crack have been reduced.

(2) The maximum size of the globes has been increased to 20 inches in diameter.

(3) Rose glass shades are being successfully made for use with Welsbach burners, changing the harsh, white light to a pleasing color.

(4) The globes have been made more refractory and more uniform in their results.

*Gas Fixtures.*—Some of the Eastern fixture manufacturers have recently taken up the manufacture of high class fixtures that are better than imported ones, including specialties in the way of single fixtures of intricate and elaborate design, on a scale not attempted in this country 5 years ago.

*Lava Tips.*—Even lava tips are being gradually improved along the lines of greater accuracy and uniformity.

### Distribution.

*Street Main Governors.*—Automatic street main governors have been improved as follows:

(1) A safety or balance governor is now being placed ahead of the usual automatic governor for the purpose of delivering gas to the latter at a constant pressure, being usually that thrown by the top lift of the holder alone. This enables the automatic governor to do its work much better than has heretofore been possible under the varying initial pressures due to the uncupping of 3 and 4-lift holders.

(2) Governors put on large outlets to new gasholders while the consumption from them is as yet small are now provided with temporary rings around the governor valves, restricting the openings so that small valves can be used; then when the consumption increases sufficiently these rings are removed and large and permanent valves are substituted. This does away with the old method of first installing a small-sized governor and later a larger one.

(3) A glass vessel is now used instead of iron for containing the mercury, enabling the operator to readily see what is going on.

(4) One chamber is now used for the mercury instead of three or four, as heretofore, and the mercury is adjusted to different heights by means of a movable displacement block, simplifying the governor and making it possible to properly adjust it the first night that it is put into use.

*House Pressure Regulators.*—With the tendency toward high pressure gas distribution the individual pressure regular for houses becomes even a more important device than heretofore. There are numerous makes upon the market and the best ones are being improved as the years go by, although no recent improvements have been radical or especially noteworthy. The valve mechanisms have been simplified and cheapened, and the sensitiveness, durability and reliability of the governors have been increased. Most of these governors employ a metal float or leather diaphragm, to which is attached a vertical rod for actuating the valve. This rod is generally supported and held in position by passing through rather tight fitting openings, which are liable to stop up with naphthaline and other deposits thus impeding the movements of the rod and interfering with the proper working of the governor. Some concerns are now supporting this rod by means of chains and other anti-friction devices, thus permitting the openings through which the rod passes to be so large that they do not stop up. The leather diaphragms formerly became dry and hard in time, as one side of them is necessarily exposed to the air, but one concern now keeps the diaphragm submerged in oil which obviates this difficulty. Governors are now made that are very efficient, reliable and not liable to get out of order. One is reported that has been in constant use for 4 years without having required any attention whatever, and is still as sensitive and as accurate as when first installed. This is probably not an exceptional case.

*Consumers' Meters.*—During the period under consideration there have been no improvements in the ordinary house meter beyond the usual gradual perfecting of parts and of methods of manufacture that are bound to result in the lapse of time from the conscientious efforts of manufacturers to better even so perfect and time honored a device as the justly respected gas meter. Many efforts have been made to depart with advantage from the Glover type of meter that has held sway, virtually in its present form, for the past 50 or 60 years, but thus far without noteworthy success. Another such attempt has recently been made by an Eastern firm, their proposed meter having a cast iron case and rotary valve, the upper half of the valve being made of ground glass. This meter is being tried experimentally. It is neat and compact in appearance and promises at least the possibility of greater durability and of greater capacity per unit of cost than the ordinary tin meter. In England, Mr. Thorp has recently introduced a decided novelty in the shape of a rotary meter, which operates on the principle of the anemometer, and which is reported upon very favorably thus far by those who have tried it.

A straight reading meter dial, having, in addition to the usual dials and index figures, an arrangement whereby the figures constituting the correct reading of the meter appear at all times completely and plainly in view through openings in the dial plate, has recently been perfected, and meters equipped with them are about to be put upon the market at

a slight advance in cost over that of the ordinary meter. This meter dial is greatly superior to those previously devised, in which the figures gradually revolve into view, and in such dials the figures are at times only partially visible, resulting in misreading of the meter.

Iron meter connections are now being recognized as possessing numerous advantages over lead connections, which they are rapidly beginning to displace.

The "Glass" complaint meter, perfected within the past 5 years, is now coming into general use and f irnishes gas companies with a most ingenious and useful means for convincing doubtful consumers that they are really burning the quantity of gas charged for on their bills.

Progress is gradually being made in the use by gas companies of the standard meter threads adopted by the American Gas Light Association several years ago.

There seems to have heen no special improvement in lock stopcocks for gas meters, but a novelty in the shape of a meter lock has very recently been put upon the market by an Ohio concern that is claimed to prevent consumers from disconnecting or by-passing their meters.

Some small improvements have been made in prepayment meters, but no distinctly new types have been introduced. These meters, as now made, are less apt to get out of order than formerly and some of the working parts have been made stronger. The cash boxes have also been improved. But the most noteworthy improvement in connection with prepayment meters is a safety device, recently brought out, which is said to allow the light to dim down, when the gas paid for has all been consumed, so as to be insufficient for use, but which does not allow it to go out altogether until about 15 hours have elapsed, thereby preventing accidents from being caused by persons putting coins into the meter after the light has gone out, and so turning gas on in bedrooms where lights have previously been burning.

*Tapping Machines.*—Tapping machines have been very much improved, and in addition to other new features are now so made that no gas escapes while the tapping is being done, thus saving gas and avoiding the risk of asphyxiation.

*Recording Pressure Gauges.*—The improvements in recording pressure gauges consist in the perfecting of the parts and increasing the variety and range of the gauges so that they are now made to record anything between full vacuum and 10,000 pounds pressure per square inch.

*High Pressure Gas Distribution.*—One of the most important steps in the recent progress of the gas business is the distribution of artificial gas at high pressures, begun about three years ago, and now demonstrated to be a mechanical and economical success. About 20 high pressure systems are now in operation throughout the country, all of them reported as giving satisfaction and saving the owners money, especially in the matter of interest charges. There is one high pressure line in the East that is 12 inches in diameter and 35 miles long.

In Derby, Pa., there is a high pressure system in operation of 35 or 40 miles of pipe, including services, in which the gas is brought at high pressure direct to the consumers' meters, individual pressure regulators being used. Mr. F. H. Shelton, of Philadelphia, has been the leader in adopting this method of distribution, and after 3 years of experience he predicts that it will work a revolution in the gas practice of the next generation. Mr. George F. Goodnow read a paper[1] at the meeting of the Wisconsin Gas Association last month, describing the successful use of this system in his city, stating that, in addition to the saving that it effects in the first cost of the plant, it gives the consumer better service, more regular pressure, with fewer freeze-offs in cold weather, besides affording a ready opportunity to employ intensified gas lighting for both street and interior illumination.

*Low Pressure Gas Distribution.*—Much attention is being paid to the proper and economical distribution of low pressure gas. In some of the larger cities a system of so-called "pumping mains" is now run from the works direct to the various points in the distribution system where the gas pressure is at times insufficient. The gas is pumped into this system of mains at a sufficiently high pressure to adequately reinforce and equalize the pressures throughout the city, this reinforcement being automatically controlled by means of balance governors on the pumping mains, placed in pits in the streets at the points where such mains discharge into the regular distribution system. When the pressure in the distribution mains in any locality rises above the proper height at which the governor at this point is set, the discharge of the high pressure gas into the distribution system at that point is automatically discontinued, but continues at the other locations in the city if still needed there. In fact, the pressure throughout the entire city is automatically regulated and equalized with an exactness and nicety absolutely impossible by means of pressure regulators at the works alone.

Gas engineers are also making progress in learning how to plan their distribution systems so as to secure the maximum conductivity per dollar expended for gas mains. Very large feeders and very small distributing mains are now coming to be recognized as the most economical arrangement. To quote from a paper read by Harry Edward Jones, in 1901, before the English Institute of Civil Engineers: "The main arteries should be as few in number and of as large a diameter as possible in order to get the largest duty from the weight of metal employed and with the least friction." This same doctrine was forcibly enunciated by Mr. Henry L. Doherty, a year previously, at a meeting of the Ohio Gas Light Association. A large distribution system is now being planned for a western city, contemplating 12 and 16-inch feeders and 2-inch wrought iron distributing mains, this arrangement having been determined upon as the most economical.

*Thawing Services by Electricity.*—This is an application of electricity that has been made within the past 5 years, having been first introduced at Madison, Wis., in 1899, and later in other northern cities. A frozen gas service covered with several feet of frozen ground is a serious matter, but it has been demonstrated that, by passing a current of electricity through the pipe, it can be quickly heated to a temperature sufficient to melt the frozen water or moisture within it, and at a cost, with proper equipment, not to exceed $5 or $10, and as low, according to one company's occasional experience, as 80 cents.

*Trenching Machines.*—Improvements have recently been made in power machines for excavating trenches for gas mains, and one concern will this spring circularize the gas companies of the country with advertising matter with reference to their machine for this purpose. The machine operates somewhat like a vertical rotary snow plow, can be had of various sizes, and for gas companies in the larger cities, or for contractors who desire to bid on such work for the various gas companies in one neighborhood, it should reduce the cost of trench work, except where the soil is rocky.

*Prevention of Electrolysis.*—Unfortunately but little progress has been made in the prevention of the electrolytic destruction of gas pipes by the return current of electric street railways operating in their vicinity. Various makeshifts and palliatives have been resorted to, such as insulating joints, paints, glazed tile coverings, tar concrete, etc., but no substantial cure for the trouble has been extensively adopted, not so much because it is a physical impossibility to do this, because the courts have not yet clearly fixed the responsibility for remedying the trouble as between the gas companies and street railway companies. The trend of court decisions is, however, to place the obligation for the prevention of the trouble upon the latter. An authority on this subject writes as follows, under date of January 21, 1903:

"I regret that so little real advance has been made during the past 5 years in the prevention of electrolysis of gas pipes. The responsibility of electric railway companies for damage done by their returning currents to the metallic pipes of gas companies and water companies has been a matter of vigorous litigation in State and Federal courts for a number of years past, but in no case has a decision been arrived at which is final. In certain cases the courts have held the railway responsible for damage, but have likewise held that the owners of the pipes must co-operate with the railway companies to prevent the damage. This has left the matter as much in the air as ever.

"It is commonly recognized that complete immunity of the pipes from injury cannot be successfully secured while the return currents of the railways are permitted to flow through the rails and earth. It is likewise recognized that the damage and danger may be greatly reduced by intelligent installation of the grounded return circuit of the railways and continuous careful supervision thereof. Railway companies have frequently been very seriously negligent in the way in which their return circuit has been installed, and they have been equally negligent in the way in which they have permitted their return circuits to become deteriorated.

"I think that the responsibility of the railway companies will be clearly determined by judicial decisions within the next two or three years, and we may then expect improvements to be entered upon which have been entirely neglected in the past. I look forward to the considerable extension of the conduit double-trolley in our large cities, wherebythe current is entirely removed from the earth, which will completely remove the possibility of danger from electrolysis in these cities; and I also look forward to the use, to some degree at least of the double overhead trolley in some of our smaller cities. In other cities I imagine that the railway companies and owners of pipes will come to some suitable compromise in which the railway company will acknowl-

1. See JOURNAL, March 9, 1903, p. 367.

edge its liabilities and will join the owners to pay the expenses of continuous supervision and repair of the pipes."

MANUFACTURE.

*Inclined Retorts.*—Whatever may be said of the relative merits of inclines and horizontals, the use of the former has increased considerably during the past five years, and the construction of the system has been improved in some minor particulars. The retorts are made longer than formerly, which is said to be an advantage, the Germans now making them as long as 18 feet and the English as long as 20 feet. The heats carried in inclined benches have been greatly increased and their construction is, therefore, made stronger, with larger combustion chambers. The charging apparatus has been improved, measured charges by means of the "shot pouch" system apparently being most in favor. A sma l hydraulic ram has been devised for moving the slide valves on the coal measuring chambers, and one has also been devised for discharging the coke from the retorts when necessary. In one American installation the side walls are arranged to carry the weight of the upper and middle retorts, relieving the bottom retorts of this burden and presumably lessening the troubles due to expansion. During approximately the past five years, more than 10,000 inclined retorts have been installed in England. In this country, inclined retorts are in operation at Louisville, Ky., and installations are being erected in New York City and Lynn, Mass. At least three foreign inclined retort building companies are now represented in this country by well known American gas works construction firms and two of our home companies are now prepared to build inclines after their own designs, while still another is making the same preparation. Just now, however, as is well known, gas engineers are disputing among themselves as to the relative economies of inclined retorts and horizontals operated by machinery.

*Horizontal Retorts, Four Tiers High.*—Benches of eight horizontal retorts placed four tiers high have been used in England for several years, but have only within the past year been adopted in this country, where they have suddenly become very popular, many persons claiming the credit of their "discovery." This style of setting is now being installed in Milwaukee, Detroit and Lowell, while the gas companies in many other cities, including Cincinnati, have decided to adopt them or are thinking of doing so. Obviously benches of this construction must needs be operated by machinery. Their advantages are:

(1) The same as those of the ordinary bench of 6's over the wide arch of a bench of 9's.
(2) A high and roomy combustion chamber.
(3) The most easily heated of any form of bench; and
(4) Economy of ground space.

*Bench Furnaces and Settings.*—There has been little improvement in the construction of bench furnaces. The rear clinkering bench, the use of which began in Germany and Great Britain many years ago, and which was introduced in this country about 15 years ago, is gradually becoming popular. In recuperator benches the arches over the furnaces have been simplified, with blocks made larger and burned hard, with fewer clay joints and larger ports for the exit of the gases into the combustion chambers. By careful selection and mixture of clays, American retorts and settings are now claimed to be as good as any in the world.

*Charging and Drawing Machinery.*—Considerable progress has been made in the introduction in this country of charging and drawing machinery and in improving and perfecting the machines themselves. Machines are now going in at Milwaukee, Detroit, and other cities, and many of the smaller companies also are considering their adoption. In fact, the tendency just now seems to be toward horizontal retorts, especially in benches of 8's, and machine charging and drawing rather than inclined retorts. The machines have recently been improved by lightening their reciprocating parts, improving the material entering into their construction, replacing chains with wire ropes, etc. One machine has been improved by the addition of an attachment to the charging scoop which spreads out the coal as the scoop is withdrawn from the retort, contributing to better results when heavily charged. Another standard make of machine has been improved by increasing its capacity and introducing an automatic damping device on the operating cylinder of the drawing machine which makes it practically impossible to damage the seat of the retort, and at the same time increasing the life of all the reciprocating parts and doing away with the jar at the end of the stroke. There has also recently been put out a combined charging and drawing machine which has a promising future on account of its adaptability to the smaller sizes of retort houses, where in the past machine charging and drawing has not been practicable, on account of the first cost of machines and the necessity for using two or more men on the separate machines. With the combined machine, one man is expected to take care of 20 benches in a single line of 15 to 18 benches, where it is necessary to run the machine over a turntable and return on the opposite side of the house. The combined machine will cost about two-thirds as much as the same capacity in separate machines. Compressed air, steam and hydraulic pressure are all used for operating the different makes of machines each having its advocates.

*Coal and Coke Conveyors.*—With the enlargement of gas works and the increasing danger from labor troubles, machinery for handling coal and coke is coming more and more into demand for the larger works, and is being considerably improved. For handling coal in horizontal runs, the belt type of conveyor is in good favor, but for elevating coal and coke, as well as for moving them horizontally, gravity and self filling grab and shovel buckets are being largely used. For conveying hot coke horizontally, belt or chain conveyors are in use and are undergoing considerable improvements. Most of the chain conveyors for hot coke use a flat bottomed trough, of either cast iron or plate, through which the coke is pulled by means of cross-bars attached to one or two chains. The 1-chain conveyor seems to be an improvement over the 2-chain, for the reason that the two chains do not stretch equally from wear, one soon becoming longer than the other, resulting in trouble with the sprocket wheels, etc. In one recently improved conveyor of this sort, for conducting hot coke away from the retorts and quenching it, the coke is partially submerged in about 4 inches of water in the trough and is pulled along so rapidly (about 100 feet per minute) that, according to the inventor, it does not have time to generate steam until it reaches the place provided for quenching it. The absence of steam is, however, probably due to the quick absorption of all the heat in the coke by the comparatively large volume of cold water into which it falls. Electricity is now being quite generally adopted as a motive power for driving coal and coke conveying machinery.

*Self Sealing Mouth Pieces.*—These are being gradually improved, one concern having recently added a detachable clamp and locking device and providing a bushing in the lower part of the operating eccentric that will give equal wear in both top and bottom holes of the cotterbar.

*Hydraulic Mains.*—There have been no noteworthy improvements in these, but the V-shaped mains are coming more into favor, and one concern has recently designed a V-shaped main the bottom of each section of which slopes gradually from both ends toward the middle, facilitating the withdrawal of the heavy tar.

*Exhausters.*—There has been quite a number of minor improvements in exhausters, tending to make the impellers more perfect in their lines and work and delivering a higher percentage of their theoretical displacement. These machines are now being made in a greater variety of sizes and designs than formerly, exhausters delivering as high as half a million feet per hour, and 400 feet per revolution, now being in use. Exhausters are now made that are vertical, with side inlet and discharge, and also horizontal with top and bottom inlet and discharge. Means have also been improved for keeping the exhausters in proper adjustment. An automatic regulating device for exhausters has recently been put into use that is said to be quite an improvement over the familiar Huntoon bucket. It is something like a natural gas regulator, with a sheepskin diaphragm that admits of a long range of movement of the valve without any variation of the resistance on the diaphragm. It is said to hold the pressure constant over a wide range of variation of steam pressure and exhauster speed.

*Tar Extractors.*—Modern condensing systems provide for the removal of all tar before the gas reaches the washer-scrubbers, thus making the latter more efficient, The familiar P. & A. tar extractor, as used in this country, has recently been improved to conform to its construction in Germany. A tar and carbonic acid extractor has been introduced, as well as a new tar extractor, in which the gas passes through a rain or drip chamber filled with liquid spray. One works has recently installed a centrifugal tar extractor that gives the gas a whirling or spiral motion, throwing the tar globules out against the sides of the pipe, where they impinge and flow down the sides of the pipe. Another experimenter thinks he has found a centrifugal tar extractor and exhauster combined, one apparatus serving both purposes.

*Scrubbers and Washers.*—The efficiency of tower scrubbers has been greatly increased by the use of an automatic flushing device, such as was described at the meeting of the Ohio Gas Light Association in 1901. A revolving brush, washer-scrubber, originally brought out in England, is also finding great favor in this country. Systems of condensing, scrubbing and washing have recently been so much improved that the oxide purifiers have much less work to do than formerly, and coals containing so much sulphur that they could not heretofore be economically used for gas manufacture can now be profitably used for this purpose.

*Purification.*—Considerable progress has been made in purification processes and apparatus during the past 5 years. Probably the most important process improvement is the one in which, as the inventor expresses it, "The purified gas revives the foul oxide." As a matter of fact, of course, it is the slight percentage of air in the gas that does the work, and frequent emptying and refilling of the box avoided by periodically, or as often as necessary, reversing the flow of the gas, by which means the oxide in each half of the box is alternately fouled and revived, one half fouling while the other half is reviving, and *vice uersa*. No ipecial design of box is essential for this process, bui the round or "cheese-box" form is being generally used. The so-called "duplex box" is also coming into use, in which there are two beds of oxide, one above the other, the gas entering between them and dividing into two streams, one stream passing upwards and the other downwards. This secures a slower rate of flow for a given area of box. In fact, the present tendency of purifying box construction is toward compactness. These "double deck" or duplex boxes are now being built as deep as 11 feet 6 inches, permitting 2 oxide beds each 5 feet in depth. Within the period under consideration the novel form of purifying box, described at the meeting of the Ohio Gas Light Association in 1898, has been successfully introduced in several cities; and one of the most radical departures of recent times from customary purification practice has been made in connection with these boxes by dispensing with the purifying house itself. This has been done at Madison, Wis., where boxes of this construction have been successfully used out of doors throughout the past winter, the purifying house being purposely omitted. The boxes are double, constituting virtually one box, 20 feet square and 13 feet 6 inches deep, supported on columns 6 feet 6 inches high, the space underneath being used for dumping the oxide. The boxes are lagged with pine sheeting, the total cost of which was only $250, and the space underneath them inclosed by wooden doors hung on weights so that they can be raised and lowered like ordinary windows. Steam coils have been placed in this space for use, if necessary, in keeping the boxes warm,

but on only one or two occasions during the past cold winter was the steam turned on as a precautionary measure, the temperature of the gas at the outlet of the boxes running generally 20° higher than at their inlet, without the use of steam. The successful operation of these boxes under the circumstances described seems to indicate that purifying houses are wholly unnecessary. About 4 years ago, at Columbus, Ind., and more recently at New Orleans, there has been introduced a box of the ordinary shape but of very cheap construction, with cement bottom and sides, and employing dry lute covers. Dry lute covers are being used to a considerable extent in England, and experience with them indicates that they can be employed with advantage and economy.

There have been some recent improvements in purifier trays, a new tyye having recently been patented by a member of the Ohio Gas Light Association. There is said to be a decided tendency at present toward the use of heavier trays, as in the English practice, trays 2 inches deep being used, with the slats thinner and closer together than in the ordinary trays.

*Station Meters.*—A noteworthy improvement has been made during the past 5 years in station meters, by the invention of a 3-compartment drum which is said to increase the capacity of the ordinary station meter from 30 to 50 per cent. I have thus far been unable to obtain a detailed description of the device, but there is no question that it constitutes a desirable and important improvement. There seems to have been no progress made in the perfecting and developing of proportional meters, although at least one prominent gas engineer is now at work upon a new type which he thinks will prove a solution of the problem.

*Gasholders.*—Probably the most important development in gasholder construction during the past 5 years is the metal-to-metal riveting of the holder shells and crowns without any paint or mixture of any kind between the sheets. One concern has also made a new design of goosenecks that obviates the use of adjustments for the rollers, thus avoiding the danger of the rollers being put out of proper adjustment by incompetent workmen or otherwise. Proposed cement holder tanks do not seem to be making much headway.

*Valves.*—An improved globe valve has recently come upon the market with renewable parts throughout, including the valve seat, and which can be packed under pressure while wide open.

An Ohio company has recently been incorporated to manufacture a safety valve for house service pipes, its purpose being to automatically cut off the flow of gas entirely if for any reason the pressure in the mains should be considerably decreased, or if the flow of gas should be temporarily interrupted.

There has been a great improvement in the ordinary large gate valves and a decided improvement in water-cooled valves for hot blast work, one concern manufacturing several varieties of the latter, in some of which the body of the valve only is kept cooled, and in others both body and valve seat, by streams of water passing through cases surrounding them. Another form permits the renewal of the seat of the valve when the old seat wears out.

Various ingenious multiple purifier valves have also recently been devised for directing and reversing the flow of gas in various ways through purifying boxes. And in this connection it should be stated that the days of the old-fashioned centerseal seem to be numbered, its place to be taken by these improved valves, which produce a more flexible means for handling the gas in accordance with the present advanced knowledge and practice in gas purification.

*Stopcocks.*—Stopcocks have been improved by making them of better metal, grinding them more perfectly, leaving larger gas-ways and making them of a greater variety of weights for various purposes.

*Photometry.*—There has been much progress made in the development of the principles and practice of photometry during the past 5 years, but before this art shall be perfected it is not unlikely that gas men will have no further use for it, as they may by that time be determining the value of their product by means of the calorimeter rather than the photometer. The recent progress and present needs of photometry are well set forth in the following extracts from a letter received last month from Prof. C. P. Matthews, of Purdue University:

"We are still very far from the realization of a satisfactory primary standard of light, although distinct progress has been made in this direction during the past few years. The advent of several new light sources of the whiter hues has accentuated the difficulties heretofore experienced in photometry from color difference. Existing standards are not of the same hue as these new illuminants. There is evident need of a new standard having a quality or color that is a mean among the qualities possessed by sources of light in common use. As we are not likely for aesthetic reasons to tolerate sources that lie without the present range of color, it would seem that the time is ripe for the development of such standard, if that be possible.

"The candle and the Carcel lamps are rapidly passing from use as light standards. In their place have risen the pentane standards, approved by the gas experts, and the Hefner amyl acetate lamp, provisionally indorsed by the electrical fraternity.

"The need of uniform secondary standards bearing the stamp of official approval is likely to be met by the nationa lbureau of standards at Washington, which will soon be in a position to supply standardized incandescent lamps for photometric purposes. Such lamps are well adapted to the photometry of the incandescent lamp or the naked gas flame. They are unsatisfactory for studies or mantle burners or the electric arc, owing to the color differences alluded to above. The existence of a common source of secondary standards will do much to unify photometric measurements and lift them from the region of doubt and uncertainty in which they have so long resided."

*Low Candle Power Gas.*—As the result of the large use of incandescent burners and the increasing use of gas for fuel purposes, a high candle power gas is no longer essential, and the demand for a low priced gas that may be used yet more extensively for fuel has in the last few years brought about a decided change in our ideas as to candle power, the tendency now being to decrease the candle power and the cost while maintaining, as far as possible, the calorific value. In some large cities in Germany as low as 10-candle gas is distributed. Quoting from a leading English gas "Journal," of December 28th, 1901: "There appears now to be an overwhelming weight of technical opinion in favor of low candle power gas, or at least in favor of a supply by each individual gas undertaking of that candle power which its position as regards coal supply renders the cheapest, irrespective of candle power, within limits—limits which some would put at 14 candles, some at 12, and some as low as 10." The South Metropolitan Gas Company some time ago obtained Parliamentary sanction for reducing the candle power of their gas from 16 to 14, and Parliament is now being petitioned by several other companies to allow them to distribute 13-candle gas. While these candle powers would be too low for this country at present, as the public mind has not been educated to accept them, yet the tendency undoubtedly is downward, and this may account in part for the present noticeable return to coal gas works construction that is repo ted by the gas works builders of this country.

*Ammonia Concentrators.*—Ammonia concentrators have been improved chiefly as to their durability, some types being now made, in all their parts, wholly of cast iron and lead.

*Cyanide Extraction.*—There has been considerable recent advancement in the extraction of cyanide compounds from illuminating gas, although progress in this direction seems to have been wholly confined to European countries. Those companies which have engaged in the business are said to have found it profitable. One company is said to be netting $40,000 per year out of a make of a billion feet of gas, by the manufacture of yellow prussiate of potash. Cyanide compounds are now being successfully and profitably obtained from the spent oxide, from the ammoniacal liquor, and directly from the gas itself. One American gas chemist explains that the reason cyanide extraction is not being taken up by gas companies in this country at present is that a process is now being tried for making cyanide out of ammonia by the aid of metallic sodium manufactured electrolytically at Niagara Falls, and as this process seems thus far to promise success, American gas companies are hesitating to invest any money in the business.

*Water Gas Apparatus and Processes.*—There seem to have been no radical improvements made in water gas apparatus during the past 5 years. One concern has, however, brought out what it terms a high carbureter design, in which the carbureter and superheater have been so extended as to crack up the oil at the lowest temperature possible, thereby retaining the heavy hydrocarbons. It also has a "wart" or "riser" connection between the generator and carbureter which is said to practically prevent the carrying over of ashes and cinders to the carbureting brick. They have also introduced what they term a divided blast construction, which consists of hollow bearing bars connected with a blast box located in the lining. The bearing bars have small openings opposite the spaces in the grate bars, through which the air is uniformily distributed under the entire grate. An eastern concern has recently introduced what is called an "economizer," its purpose being to utilize the heat that is generally blown up the chimney when blasting up the ordinary water gas apparatus. They turn this hot blast through a shell containing a series of cast iron tubes through which the feedwater to the boiler passes, thereby utilizing to excellent advantage (so it is claimed) this otherwise wasted heat. There are now two new oil sprays on the market for spraying oil into the carbureter, both of which are said to be very effective and advantageous. One original and enthusiastic experimenter reports that he is now cosntructing a plant on a fairly large scale by which he hopes to make water gas by a continuous process. In California there is now in quite extensive use a new process for making water gas wholly out of California crude oil without any solid fuel whatever, but I have been unable to obtain a description of the apparatus and its operation.

The Dellwik process of water gas manufacture, introduced within the past 5 years, has, for some reason, been tried only experimentally in this country, not having been regularly adopted, so far as I know, in any plant. But in England, and more especially in Germany, the process is gaining headway and promises much for economy in water gas manufacture. Under this process, which increases the velocity of the air blast when blowing up the generator fuel to incandescence, the $CO_2$ does not have time to decompose to CO, and thus a much greater proportion of heat than with the ordinary process is imparted to the fuel bed, where it is needed, instead of being sent forward to the carbureter and superheater where so much heat is not needed, and thus a great waste of heat is prevented. The capacity of the apparatus is also thereby increased, which means a saving in cost of labor and in radiation of heat from the apparatus. A prominent American gas engineer writes me as follows:

"The Dellwik process, to my mind, is a fundamental discovery in gas making. But it seems hardly fair to regard it merely as a discovery in gas making, for it will have even a greater influence upon fuel economies in other industies than in the gas business. The discovery of this process is certainly more important, in my opinion, than any other discovery since the invention of the Lowe machine."

*By-Product Coke Ovens.*—An idea of the progress of by-product coke ovens in this country may be gathered from the statement that in 1901 only about 5.4 per cent. of the total metallurgical coke manufactured was made in by-product coke ovens, whereas it is estimated by the best authority that with the ovens that have since been completed and that are now being built the additional production will be such as to bring the amount to 13 per cent. of the total. Five years ago gas companies looked upon by-product coke ovens as being simply an adjunct of the iron and steel business, but they are now beginning to adopt them for

the manufacture of their own gas in those localities where there is a large use for coke. It is confidently predicted by one man engaged in the business that this process of making gas will, from now on, be rapidly adopted by many of the gas companies of this company. There are now two or three different by-product coke oven processes in operation in the United States, and many improvements have been made in them during the past 5 years. The size of the ovens themselves has been considerably increased and firebrick and settings for their construction are now being made in this country equal to those obtainable from abroad, and much cheaper. In one process the benzol is extracted from that portion of the gas which is evolved during the last half of the carbonization and is used to enrich the gas evolving during the first half and that is intended for illuminating purposes. An under-fired principle has been adopted by means of which the gas used for heating the ovens is burned practically with a Bunsen flame. The foul gas mains have been elevated to avoid the formation of pitch and a new quenching car that is a great improvement over the old form has been put into use.

The growth of the by-product process in this country since 1897 has been as follows:

| Year. | Number of Completed Ovens. |
|---|---|
| 1897..... | 280 |
| 1898..... | 520 |
| 1899..... | 1,020 |
| 1900..... | 1,085 |
| 1901.. ..... | 1,165 producing 1,179,900 tons of coke. |

At the close of 1901 there were also 1,533 ovens in course of erection, being considerably more than the total number then in use. There are now (March, 1903) 2,232 of these coke ovens in operation in this country, having a capacity for carbonizing about 13,400 tons of coal per day; and 1,286 additional ovens are being erected at the present time.

*Gas Producers.*—During the past 5 years the following improvements have been made in gas producers:

(1) The mechanical handling of coal and ashes has been improved and more nearly perfected.

(2) An automatic feeding and coal distributing device has been put into successful use.

(3) An automatic, water-cooled, motor-driven stirrer has been devised and put into use, increasing the capacity of the producer about 20 per cent., conducing to a uniform quality of gas produced and decreasing labor.

(4) The Mond gas producing apparatus, saving the by-products, has been improved and largely introduced, especially in Europe. Detroit also has a plant of this character.

(5) An arrangement has been devised for operating the entire producer apparatus under a partial vacuum, the air and steam being sucked through the fuel bed by the engine itself, thus doing away with the boiler and holder, the steam being produced by an open heater close to the producer.

(6) Producers have been adapted to the manufacture of gas out of peat.

MISCELLANEOUS.

*Odds and Ends from England.*—English gas journals state that one experimenter, working upon an idea advanced by Professor Lewes, seems to have discovered a practical process for successfully converting coal tar into illuminating gas by means of a modified water gas generator. Also, that a well-known engineer has devised a reversible condenser for the extraction of naphthaline from the gas that has successfully withstood a year's working test. Professor Lewes also seems to have hit upon a successful method of enriching water gas by passing it through coal gas retorts during the process of carbonization. At Tipton, an admixtnre of about 30 per cent. of blue water gas with coal gas is being made in this manner, and the mixture is brought up to the candle power of the original coal gas by the use of only about one-third of a gallon of benzol per 1,000 feet of blue water gas.

*Acetylene Lighting.*—There has been much progress in acetylene lighting during the past 5 years. In fact, practically all of the progress it has thus far made has necesiarily been accomplished during the period named, as it was only 7 years ago that a cheap method was discovered for manufacturing calcium carbide. The annual production of calcium carbide in this country is now about 29,000 tons, in Europe about 50,000 tons. Notwithstanding this increased production, its price has not been materially reduced, being now in quantity about $65 per ton. In 1898 there were but two small plants in this country for manufacturing acetylene and distributing it as an illuminant by means of pipes in the streets; now there are 56 towns and villages lighted with it, the largest being Wabash, Ind., with a population of 8,600. In Spain a city of 14,300 is being lighted with it, besides many smaller towns. In 1901 it was lighting 47 towns in Germany and 26 in France. Its use for portable and isolated lighting, such as carriages, railway coaches, country residences and club houses, has greatly increased, and the means for its manufacture and consumption have been greatly improved. It has been discovered that a mixture of one part acetylene to three parts Pintsch gas makes a much better illuminant for railway coaches than either of these gases alone, and this mixture is being largely adopted for car lighting in Germany and France. Probably the best and most authentic statement of the recent progress of acetylene lighting is the following made by Professor Vivian B. Lewes in a lecture delivered in December, 1902:

"Although much hampered in its progress by the determined booming of improper forms of apparatus that gave rise to much trouble and waste, it has gone forward without a check, and improvements have been made in all directions. There are several generators now on the market which leave little or nothing to be desired in their construction, as they are both simple and effective; and for country house lighting the beauty of the light has led to its firmly establishing itself as a favorite. In the early days bad generators and smoking of the burners proved difficulties, bnt the improvements in burners as well as in generators have been of a marked character, and besides the excellent burners of continental origin Bray is now making some excellent ones which show an improvement on the older forms of burner in that they can be turned down without smoking. This will do away with the inconvenience which was inseparable from the older form of burners, of either having to turn out the jet or leave it burning at its full size."

Acetylene for general distribution and use does not, however, seem to obtain a foothold where ordinary coal or water gas is obtainable.

*Municipal Ownership of Gas Works.*—There seems to be no marked tendency toward municipal ownership of gas works in this country, there having been but one such transfer in the last few years, that being the recent case of Holyoke, Mass. Taking into consideration the leasing by a private company of the Philadelphia gas works, there is much less gas now being made by municipalities in this country than there was a few years ago. In Great Britain and Ireland the transfer from private to public ownership is proceeding so slowly as to be hardly noticeable, and the percentage of municipally owned gas works is much smaller than the advocates of municipal ownership would have us believe, being only about 17 per cent. of the total.

The foregoing summary indicates that recent progress in the gas business has been chiefly along the following lines:

| | |
|---|---|
| Gas engines, | Low candle power gas. |
| Arc gas lamps, | High pressure distribution. |
| Uses of gas for fuel, | By-product coke ovens. |
| Producer gas, | |

[In an appendix Editor Butterworth acknowledge his indebtedness to a long list of those who aided him in the compiling of the facts presented.]

[To be Continued.]

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

GENERAL MANAGER HAYES reports that the plant of the Shenandoah (Ia.) Gas Company will be in active operation by September 1st.

AT an election of the voters of La Junta, Cal., one of the matters balloted upon was whether or not the town should favor the construction of a gas works. The proposition was decided in the negative.

A CORRESPONDENT in Montreal, Can., writing under date of the 13th inst., says: "Two wonderful instances are reported in this city, each of which is of recent occurrence. In the first instance a man approached the cashier of the local Gas Company and handed him an envelope containing $800 in bills. He refused to give his name, but said that the party for whom he was acting had used the Company's product for years but had not paid for it. The second case was in the handing over to the Company of the sum of $300, which handing was made by one of the priests of the Notre Dame Cathedral, who informed the Company that it was 'conscience money' from a penitent." Oh, that such qualms would become epidemic in Greater New York—and elsewhere.

WE understand that Mayor Reed, of Kansas City, Mo., has determined to appoint O'Fallon Jenkins official inspector of gas and meters for that city in place of W. H. Clelland, the present incumbent. Politics solely is back of the substitution.

AT the annual meeting of the Utica (N. Y.) Gas and Electric Company the Directors chosen were: A. N. Brady, W. E. Lewis, Jno. F. Maynard, Chas. S. Symonds, Chas. B. Rogers, William T. Baker, M. Jesse Brayton, Daniel N. Crouse and Samuel A. Beardsley.

THE residents of South Wilmington, Del., are extremely anxious that the proprietors of the Wilmington Coal Gas Company should extend their distributing system to South Wilmington. The Company, however, refuses to do so until a satisfactory franchise has been agreed upon.

AT the annual meeting of the Knoxville (Tenn.) Gas Light Company the officers chosen were: Directors, J. Y. Johnston, W. P. Washburn, Jno. E. Hood, F. L. Fisher and John L. Rhea; President, J. Y. Johnston; Vice-President, W. P. Washburn; Secretary, Treasurer and General Manager, John E. Hood.

THE Essex and Hudson Gas Company, of Newark, N. J., will this summer extend its main pipes to the borough of Caldwell.

IT is likely that the plants and franchises of the Stillwater (Minn.) Gas and Electric Light Company, which concern controls the water privileges of the Apple River Power Company, will soon pass into the control of the Western Gas and Investment Company, of Chicago.

NEWS from Annapolis, Md., dated the 10th inst., is that the Directors of the Annapolis Gas and Electric Light Company have decided to make a new issuance of bonds, amounting altogether to $105,000, to be given exclusively to the stockholders of the Company in place of dividends. The funds raised by this increase are needed to defray the expenses incurred in making the extensive improvements that are contemplated for the Company's plant on St. John street.

THE Montreal (Can.) Light, Heat and Power Company, is increasing the capacity of its water gas division, and with that end in view a contract has been awarded to the Economical Gas Apparatus Construction Company, of Toronto, for the erection of two sets of its improved carburetted water gas apparatus, each set to have a daily capacity of 1,000,000 cubic feet.

AT a meeting of the Directors of the Hartford City (Conn.) Gas Light Company the following resolution respecting the memory of the late Mr. Hugh Harbison was adopted: "On the 10th day of March, 1903, in the 71st year of his age and the 39th year of his service as a Director of this corporation, Hugh Harbison died. The value of his service will be so often recalled by his fellow Directors that the present Board of Directors of this Company need no minute on the records to be reminded thereof. It is fitting, however, that such long and faithful service as that given by Mr. Harbison to this Company, should be noted, and our successors in turning to the list of former Directors, should be well advised of what character Mr. Harbison bore among us. He was loyal to duty in affairs large and small; honest in his point of view; sound in judgment; positive and courageous in advice; and persevering in the maintenance of an adopted policy. He was in the fullest sense of the phrase a reliable man. While Mr. Harbison was of very strong convictions, he never allowed the warmth of opinion to mar a uniform courtesy of manner and conduct. He met honest differences by firm persuasion without hostility. Of strong personal character, conservative temperament, enduring courage, he gave this Company his best and his unmeasured service from the year 1865 until his death. We direct that a copy of this minute be sent to the family of Mr. Harbison, and that the Secretary of the Company record the same at length upon its books. THOMAS EVANS, Secretary."

MR. ALEXANDER HARBISON, ex-Mayor of Hartford, has been elected to the vacancy on the Board of Directors of the Hartford City Gas Light Company caused by the death of his brother, Mr. Hugh Harbison.

THE semi-annual dividend of the Rochester (N. Y.) Gas and Electric Company has been reduced to 1½ per cent., thus putting the stock on a 3 per cent. basis. President Archer, when asked for the reasons which led to this action, said: "The explanation of the reduction of the dividend on the common stock of the Company is very simple. In order to meet the increased demand for gas, at the lower price, it is necessary for the Company to expend a very large amount of money in the extension of the gas plant. The Board of Directors considered it proper business practice to appropriate a portion of the earnings of the Company to make these betterments."

THE proprietors of the Chatham (Ont.) Gas Company have awarded to the Economical Gas Apparatus Construction Company, of Toronto, Can., the contract for a complete condensing and scrubbing apparatus. The works now have a capacity of 300,000 cubic feet per diem. Westinghouse gas engines, aggregating 200-horse power, are being used with perfect satisfaction to generate electricity for the incandescent electric lighting division of the Company's trading.

MESSRS. H. E. MITCHELL, T.W. Cramp, C. L. Serrill, R. C. Robinson and A. B. Beadle will, on the 4th prox., apply to the Governor of Pennsylvania for a charter for the Palmer Gas Light Company, the purpose of which is "to manufacture and supply gas for lighting only to the public and persons, partnerships and corporations desiring the same in the township of Palmer, Northampton county, Pennsylvania."

THE same applicants will, on the day above named, also make application for the right to construct and operate gas plants in the towns of Forks and Williams, respectively, both of which places are in Northampton county, Pa.

THE proprietors of the Dedham and Hyde Park (Mass.) Gas and Electric Light Company have announced the following schedule of selling rates--the discounts are not available unless the bills are paid on or before the 15th of each month:

| Consumption per Month. | Gross, per 1,000. | Discount. Cents. | Net. |
|---|---|---|---|
| 100 to 1,900 cubic feet | $1.60 | 10 | $1.50 |
| 2,000 to 2,900 " | 1.60 | 15 | 1.45 |
| 3,000 to 3,900 " | 1.60 | 20 | 1.40 |
| 4,000 to 4,900 " | 1.60 | 25 | 1.35 |
| 5,000 to 5,900 " | 1.60 | 30 | 1.30 |
| 6,000 and all above | 1.60 | 35 | 1.25 |

Superintendent Walker has been going along at Hyde Park in his usual thorough way, and the results achieved under his intelligent management are satisfying and gratifying to his employers.

IT is said that the Birmingham (Ala.) Railway, Light and Power Company will construct a gas plant at Bessemer, Ala. It now operates an electric lighting plant in Bessemer.

THE Columbus (O.) Gas Light and Heating Company has elected the following officers: President and Treasurer, John G. Deshler. Vice-President, George W. Links; Secretary, H. M. Work; General Manager, J. D. Johnston.

THE Suburban Gas Company, of Chester, Pa., has instituted a novel contest, under which it offers prizes aggregating $75, to be divided as follows: $25, $20, $15, $10 and $5, the sums named to be awarded in order of merit to the 5 employees making practical suggestions as to the best means of improving the different branches of the Company's trading.

MR. ARTHUR E. BOARDMAN sailed for Europe last Thursday. He expects to return by June 1st.

## The Nernst Lamp in the Berlin Court of Appeal.

The *Gas World* says that the Court of Appeal in Berlin have decided against Herr Wobbe, who had brought an action for revocation of the Nernst lamp patent, with costs of both trials, including the costs of Professor Nernst. The use of bad conductors which become better conductors when hot was not, in itself, unknown or a novelty in practice, for Jablochkoff had applied this in 1877, in his kaolin lamp. In that lamp sparks ran along kaolin and in a few seconds made it so hot that it became a better conductor and became so hot that it gave a bright light.

Nernst, in his patent of July, 1897, in a similar way, made the current run through the bad conductor; but in his patent of December, 1897, he introduced external heating, which is itself referred to in Du Moncel's book of 1879, which mentions the use of a spirit lamp. Dr. Nernst used magnesia and similar substances, and Jablochkoff had already mentioned magnesia among other things; but Nernst's results with magnesia were due to its admixture with other things, as set forth in his patent, and he was the first to get any results with moderate currents of ordinary voltage through preheating.

This was undoubtedly a stride in advance, whether it is formulated in the specification or not. He did make it clear, through the data which he gave, that the lamp would work with low voltages and small consumptions of energy. Jablochkoff needed high-tension currents in order to make the sparks which would heat his kaolin and start his lamp; after this stage was over, currents of lower tension would perhaps serve to keep the lamp going, but he doesn't say so, rather the contrary, for he keeps up a current of high tension through his first kaolin strip. Du Moncel's book would in no way lead to the conclusion that, once heating had been effected by a spirit lamp, a low voltage current, small in quantity, would keep the oxide at a white heat, for all it says is that with 12 Leclanché cells preheating with a lamp will enable a current to be maintained such as will produce one degree deflection in a galvanometer.

The inference from this would be that a high-tension current would be needed in order to keep a lamp alight; and Dr. Nernst introduced what was a practical novelty, the keeping a rod of oxide at a very high temperature from end to end, after preheating, by means of a 118-volt current. His patent, has, therefore, to be upheld.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

MONDAY, APRIL 20, 1903.

## The Market for Gas Securities.

The net result of the trading in Consolidated gas for the week leaves quotations just as they were on the eve of Good Friday. In the break that followed the opening of the Exchange after its members' Easter holiday, Consolidated sold down to 202, on very light trading, the bulk of which was for the short account. The latter interest is said to be quite a large one just now, and it is more than likely that some of the shorts will be sorry they were not "longs." The Monroe municipal lighting bill has a very quick and feeble pulse at the moment, and the positive belief of good legislative medicine men is that all the favorers thereof will be unable to prevent the measure from a peaceful death. City gas bond issues are in ever-increasing demand, particularly the long term fives.

Brooklyn Union is at nominal figures, and it is hard to understand why the nominal quotations stand, unless it is that insiders are disposed, if not more than disposed, to keep the stock at a point that will dispirit small owners from holding on. Brooklyn Union is worth 250 cash, if it is worth anything. Peoples, of Chicago, moved up about 4 points in the week. By July 1st it will be selling at 115. Baltimore Consolidated is below 70 the first time in a long while. Washington (D. C.) gas is quoted at 412, and the Laclede issues have stiffened some. We do not quite understand why the common is not worth par on the Exchange.

## Gas Stocks.

**Quotations by George W. Close, Broker and Dealer in Gas Stocks.**

16 WALL STREET, NEW YORK CITY.

APRIL 20.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $73,177,000 | 100 | 206 | 206½ |
| Central Union, Bonds, 5's. | 3,000,000 | 1,000 | 109 | 111 |
| Equitable Bonds, 6's | 1,000,000 | 1,000 | 105 | .. |
| " 1st Con. 5's | 2,300,000 | 1,000 | 118 | 120 |
| Metropolitan Bonds | 658,000 | .. | 108 | 112 |
| Mutual | 3,500,000 | 100 | 310 | 325 |
| Municipal Bonds | 750,000 | .. | .. | .. |
| New Amsterdam Gas Co.. Bonds, 5's | 11,000,000 | 1,000 | 108½ | 109 |
| Northern Union, Bonds, 5's. | 1,250,000 | 1,000 | 104 | 107 |
| New York and East River.. Bonds 1st 5's | 3,500,000 | 1,000 | 112 | 113 |
| " 1st Con. 5's | 1,500,000 | .. | 109 | 111 |
| Standard | 5,000,000 | 100 | 132½ | 140 |
| Preferred | 5,000,000 | 100 | 152 | 160 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 115½ | 118 |
| Yonkers | 299,650 | 500 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 908 | 912 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 119 | 119½ |
| Bay State | 50,000,000 | 50 | ⅝ | ⅛ |
| " Income Bonds | 2,000,000 | 1,000 | .. | 75 |
| Binghamton Gas Works.. | 450,000 | 100 | 28 | 30 |
| " 1st Mtg. 5's | 500,000 | 1,000 | 93 | 96 |
| Boston United Gas Co.— 1st Series S. F. Trust | 7,000,000 | 1,000 | 82 | 85 |
| 2d " " " " | 3,000,000 | 1,000 | 47½ | 50 |
| Buffalo City Gas Co. | 5,500,000 | 100 | 7 | 10 |
| " " Bonds, 5's | 5,256,000 | 1,000 | 73 | 76 |
| Capital, Sacramento | 500,000 | 50 | .. | 35 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Central San Francisco | 000,000 | .. | 106 | 108 |
| Chicago Gas Co. Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104¼ |
| Cincinnati Gas & Elec. Co.. | 29,500,000 | 100 | 97 | 98 |
| Columbus (O.) Gas Co., 1st Mortgage Bonds | 1,500,000 | 1,000 | 101 | 101½ |
| Columbus (O.) Gas Lt. & Heating Co | 1,682,750 | 100 | 88¾ | 89½ |
| Preferred | 3,026,500 | 100 | 107½ | 109 |
| Consumers, Jersey City Bonds | 600,000 | 1,000 | 103 | 106 |
| Consumers, Toronto | 1,700,000 | 50 | 218 | 225 |
| Consolidated, Baltimore... | 11,000,000 | 100 | .. | 69 |
| Mortgage, 6's | 3,600,000 | .. | .. | 115 |
| Chesapeake, 1st 6's. | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's. | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's. | 1,490 000 | .. | .. | 112 |
| Consolidated Gas Co. of N.J. | 1,000,000 | 100 | 15 | 17 |
| " Con. Mtg. 5's | 880,000 | 1,000 | 85 | 87 |
| Consolidated G. & E. Co.'s. Little Falls, N.Y. | 90,000 | 100 | .. | 100 |
| Bonds | 75,000 | .. | .. | 100 |
| Detroit City Gas Co. | 4,825,500 | 50 | .. | 89 |
| " Prior Lien 5's | 5,603,000 | 1,000 | 99½ | 100 |
| Detroit Gas Co., 5's. | 981,000 | 1,000 | 77 | 79 |
| " Inc. 5's | 16,000 | 100 | 98½ | 100 |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Essex and Hudson Gas Co. | 6,500,000 | .. | 39 | 40 |
| Fort Wayne | 2,000,000 | .. | .. | .. |
| " Bonds | 2,000,000 | .. | 55 | .. |
| Grand Rapids Gas Lt. Co. 1st Mtg. 5's | 1,225,000 | 1,000 | 104½ | 105 |
| Hartford | 750,000 | 25 | 245 | 265 |
| Hudson County Gas Co., of New Jersey | 10,500,000 | .. | 25 | .. |
| " Bonds, 5's. | 10,500,000 | .. | 101 | 103 |
| Indianapolis | 2,000,000 | .. | 80 | 85 |
| " Bonds, 6's. | 2,650,000 | .. | 105 | 107 |
| Jackson Gas Co. | 250,000 | 50 | 73 | 75 |
| " 1st Mtg. 5's. | 290,000 | 1,000 | 101 | 102½ |
| Kansas City Gas Light Co., of Missouri | 5,000,000 | 100 | .. | 36 |
| Bonds, 1st 5's. | 3,822,000 | 1,000 | 102 | 104 |
| Laclede, St. Louis | 10,000,000 | 100 | 98 | 100 |
| Preferred | 2,500,000 | 100 | 100 | 110 |
| Bonds | 10,000,000 | 1,000 | 109½ | 110 |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | | 60 |
| Bonds | 1,000,000 | 1,000 | 60 | 65 |
| Louisville | 2,570,000 | 50 | 130 | 140 |
| Madison Gas & Elec. Co. " 1st Mtg. 6's. | 350,000 | 1,000 | 107½ | 108¼ |
| " 6 per cent. scrip, due 1910 | 100,000 | 25 | 85 | 87 |
| Montreal, Canada | 2,000,000 | 100 | 218 | 184¾ |
| Nashville Gas Lt. Co. | 1,000,000 | 100 | 110 | .. |
| Newark, N. J., Con. Gas Co | 6,000,000 | .. | 56 | 58 |
| Bonds, 6's | 4,600,000 | .. | 105 | 105¾ |
| New Haven | 1,000,000 | 25 | 300 | 325 |
| Oakland, Cal. | 2,000,000 | .. | 46 | 47 |
| " Bonds | 750,000 | .. | .. | . |
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 103¾ | 104 |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage. | 20,100,000 | 1,000 | .. | .. |
| 2d " | 2,500,000 | 1,000 | 104 | |
| Rochester Gas & Elec. Co.. | 2,150,000 | 50 | 88 | .. |
| Preferred. | 2,150,000 | 50 | 118 | .. |
| Consolidated 5's | 2,000,000 | .. | 87½ | 90 |
| San Francisco, Cal. | 10,000,000 | 100 | 54 | 55 |
| St. Joseph Gas Co. " 1st Mtg. 5's. | 751,000 | 1,000 | 95 | 96½ |
| St. Paul Gas Light Co. | 1,500,000 | 100 | 45 | 47 |
| 1st Mortgage 6's. | 650,000 | 1,000 | 113 | 116 |
| Extension, 6's. | 600,000 | 1,000 | 112¾ | 115 |
| General Mortgage, 5's.. | 2,465,000 | 1,000 | 92 | 93 |
| Syracuse, N. Y. | 1,975,000 | 100 | 42 | 45 |
| Bonds. | 2,047.000 | 1,000 | 98½ | 99½ |
| Washington, D. C | 2,800,000 | 20 | 411¼ | 412½ |
| First mortgage 6's. | 600,000 | .. | .. | .. |
| Western, Milwaukee. Bonds, 5's | 4,000,000 | .. | 109½ | 110 |
| Wilmington, Del. | 600,000 | 50 | 232 | .. |

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## STOCKHOLDERS' MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., February 27, 1903.

The Annual Meeting of the Stockholders of the United Gas Improvement Company will be held at the office of the Company, northwest corner of BROAD AND ARCH STS., PHILADELPHIA, on Monday, May 4, 1903, at 12 o'clock, noon, for the purposes of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the Company from 565,000 shares, of the par value of $50 each, to 734,500 shares, of the par value of $50 each, and transacting such other business as may properly come before the meeting.

The stock transfer books will be closed from 3 P.M., April 28, until 9 A.M., May 5th.

By order of the Board of Directors.

1448-8 LEWIS LILLIE, Secretary.

## COOKING BY GAS.

**MISS RUTH WILKINS,**

**Lecturess on Cooking by Gas.**

Terms and references sent on request. Address,
1453-4 509 N. CHURCH ST., ROCKFORD, ILLS.

## MISS LILY HAXWORTH,

**Cooking Teacher and Lecturer,**

(GOLD MEDALLIST),

Is open for engagements. For terms, etc.,
1441-3m Address 323 QUINCY ST., BROOKLYN, N. Y.

## Position Wanted

**AS MANAGER OF A GAS COMPANY,**

By a man thoroughly competent. Am successful in all details of the business, with several years' experience,
1452-tf Address, "G. A.," care this Journal.

## Position Wanted.

A young man, 25 years of age, for 7 years with a gas company, seeks a position. Has had best of experience in gas-fitting (connected and open work), meter setting, statement taking, complaint work, main and service laying; also handy at draughting. Best of references.
1454-1 Address, "B. R.," care this Journal.

## WANTED,

**Position in a Gas Office by a Young, Married Man.**

Capable of managing office or taking charge of any department. A-1 references. Ten years' experience. Understands up-to-date methods of selling gas.
1454-1 Address, "L. H.," care this Journal.

## WANTED,

**Position as Superintendent of Gas Works.**

Fifteen years' experience in manufacturing and distributing departments. Can give good references. Have charge of gas works at present. Address, "F. C.,"
1453-2 Care this Journal.

## Position Wanted

By a party who for the past 12 years has filled a responsible position in one of the largest gas companies in the United States, and is a thorough systematizer and hustler for new business. Can furnish satisfactory reasons for desiring to make a change. Best references as to ability and energy as a gas man Address, "AMBITION,"
1453-2 Care this Journal.

## WANTED,

**Experienced Gas Company Canvassers,**

By a gas company in Greater New York. Address, stating experience,
1454-1 "N. Y.," care this Journal.

## WANTED,

**AN EXPERIENCED GAS MAKER,**

To operate the Lowe, improved water gas apparatus. Annual output 4,000,000.
Address, "S.,"
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## PARTNER WANTED.

**Experienced Man in Gas Business Wishes Partner,**

To erect gas works in one or two good towns. Will put services against money interest. Equal division. Address, "FIDELITY,"
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## SUPERINTENDENT

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Superintendent for coal gas plant in city of 20,000. State reference, age, and salary expected. Good opportunity for the right man. Address, "NORTHWEST,"
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A man capable of managing a gas appliance department in a town of 100,000 inhabitants. Must be conversant with advertising and modern methods. Address, with references and salary expected, "WESTERN,"
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**SET OF 4 PURIFIERS.**

Six feet by 10 feet 6 inches by 3 feet, with 8-inch connections; wet centerseal and overhead hoists. Address, the
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Two Purifying Boxes, 10 feet by 12 feet.
Two Centerseals, 8 inch connection.
Three 3-foot Water Gas Apparatus.

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## FOR SALE.

**20-horse Power Otto Gas or Gasoline Engine,**

In first-class condition. Address,
EARLE H. BUCK,
1452-tf Mgr. Citizens Gas Co., Vincennes, Ind.

## FOR SALE.

**5-FOOT WATER GAS APPARATUS.**

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1449-tf Flushing, N. Y.

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**Six purifying boxes,** 6 feet by 6 feet by 2½ feet, with 6 inch connections. Complete, with seal and all connections.

**One purifying box,** 10 feet by 10 feet by 3 feet, with all connections.

**One 12-pipe condenser,** 6½ feet long, 20 inches wide and 10 inches deep, with 6 inch connections. All in first class condition.

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1454-tf MARQUETTE, MICH.

## WANTED,

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A coal gas works in a town of 10,000 to 20,000 inhabitants. Central or Middle West preferred. Replies strictly confidential.
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**Utilize Your Gas Liquor.**
NO EXTRA LABOR OR OPERATING EXPENSES.

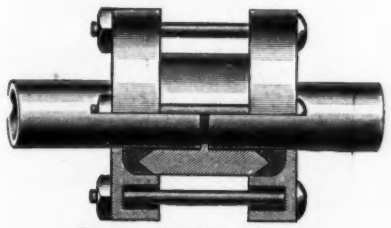
**IMPROVED AMMONIA CONCENTRATOR.**

About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, - Detroit, Mich.

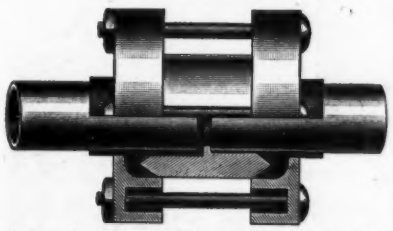
**S. R. DRESSER,**

**BRADFORD, PENNSYLVANIA, U. S. A.,**

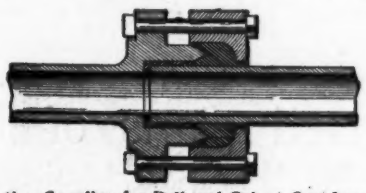
**Patentee and Manufacturer of Specialties for Oil and Gas Lines.**



Regular Coupling. Style 1.



Insulating Coupling for Wrought Iron Pipe. Style 5.



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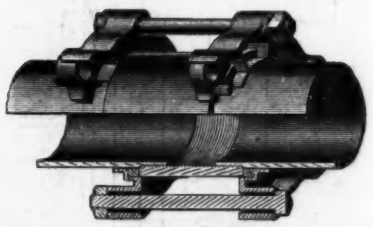

Clamp. Style 4.

**Pipe Couplings, Sleeves, Clamps, Crosses, Tees and Ells.**

My Insulating Coupling prevents the destruction of pipe by electrolytic action, in either water or gas lines.

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**ROYAL E. BURNHAM,**

**Solicitor of Patents and Counsellor in Patent Causes.**

**833 Bond Building, Washington, D. C.**

Send for Pamphlet on Patents.

1442-tf

Established 1845. Reorganized 1902.

**The Kreischer Brick Mfg. Co.,**

Manufacturers of the very best quality of Clay Retorts, Blocks, Tiles, Settings and Firebrick of every description.

**Also Miners and Shippers of Fireclay, Fire Sand, Ground Brick in Barrels.**

WORKS: KREISCHERVILLE, STATEN ISLAND.
OFFICE: 119 E. 23D STREET, NEW YORK CITY.

**1903. NEW DETROIT 1903.**

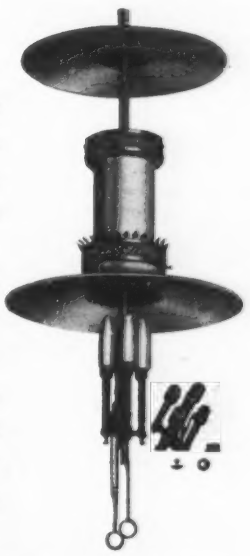
***Force Draft***

**ARC GAS LAMP,**

With double flash pilot. We save 25 per cent. gas over any other arc and produce more candle power. To light consumption what the gas range is to fuel.

**A Handsome Fixture. Always in Order.**

We will send one or more lamps on 30 days' trial to Gas Companies who maintain the lamps. Write for quotations and circulars. We will save you money.



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Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

**UTICA PIPE FOUNDRY CO.**

Manufacturers of Lead Pipe, Solder, etc. and Jobbers of Plumbers' and Tinners' Goods.

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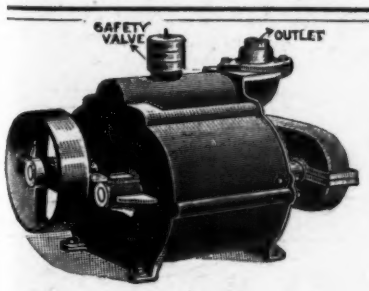
Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

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## OAKHILL GAS RETORT AND FIREBRICK WORKS.

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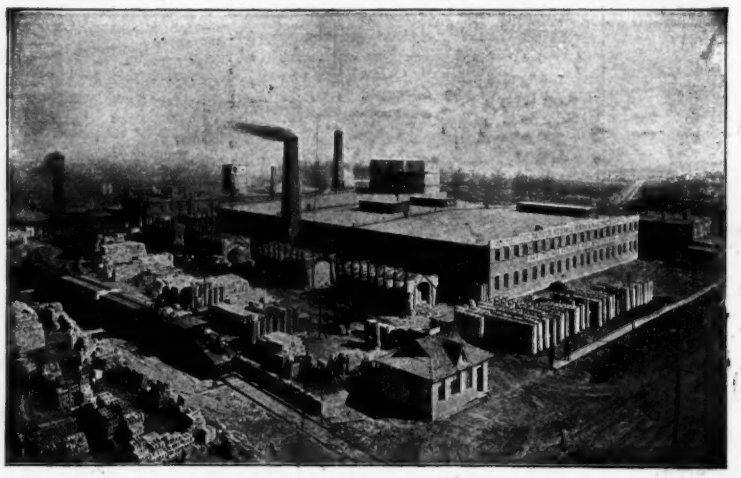

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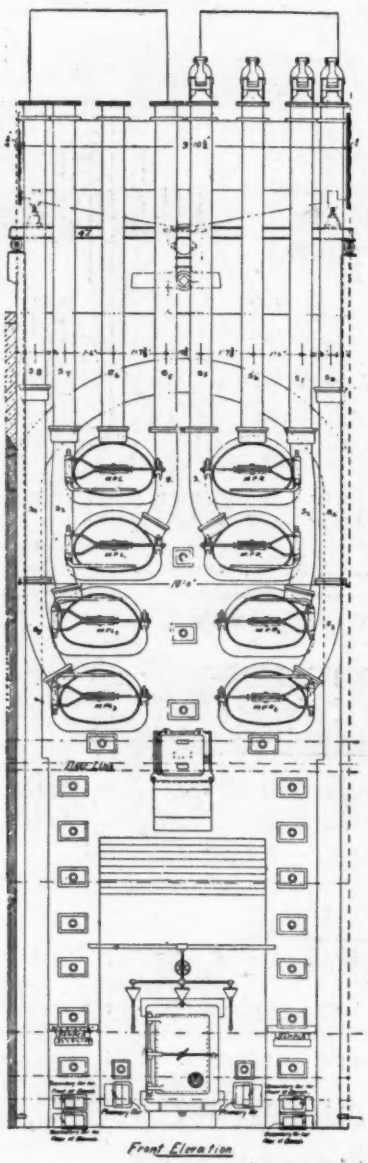

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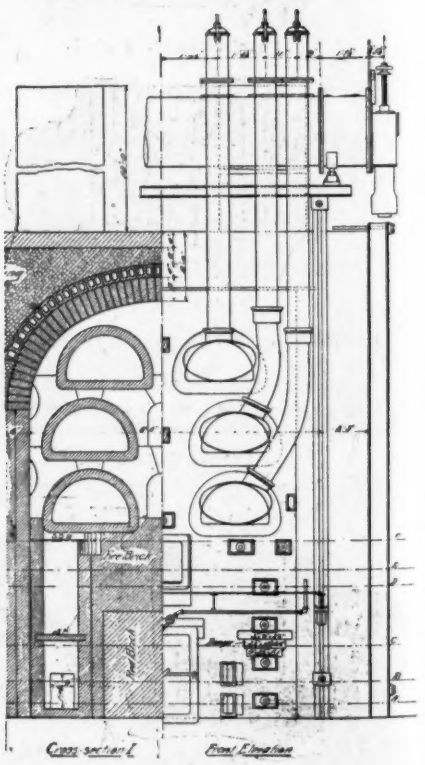


## *The Ball Check.*

*Pat. Nov. 25, 1902.*

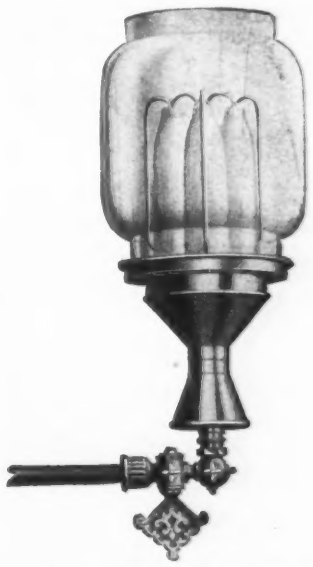
**ANY BURNER.**

ANY GAS--ANY PRESSURE.
INSTANT ADJUSTMENT.

HIGHEST EFFICIENCY.

**"JUST A TWIST OF YOUR WRIST AND YOUR LIGHT IS BRIGHT."**

"THE BALL DOES IT ALL."



Triple Arc Ball Check Lamp fits any chandelier or gas bracket. Three times the light of the single mantle burner, yet burns only double the amount of gas. More light—less gas. Greatest illuminator in the world for the money.

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SPECIAL ATTENTION GIVEN TO THE REMODELLING AND EXTENDING OF THE PROPERTIES OF WORKS NOT UP-TO-DATE.

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## CLEVELAND, OHIO.

**Coal and Water Gas Apparatus, Bye-Product Machinery, Structural Work and Connections.**

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6 SIZES.
5 PRESSURES.

Made with a check to consume rated amounts accurately.

SIZES, - 1½, 2, 3, 4, 5, 6 feet. - - - PRESSURES, - $\frac{8}{10}$, $\frac{12}{10}$, $\frac{15}{10}$, $\frac{20}{10}$, $\frac{25}{10}$.

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**Gas Analyses of All Sorts and Conditions,**

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**Analyses of Solid and Liquid Materials as Well,**

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**Also desirable franchises.**

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**GAS BURNERS,**

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Drip Pumps, Service Cleaners, Gasfitters' Proving Pumps and Mercury Gauges.

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**Hughes' "GAS WORKS,"**

**Their Construction and Arrangement,**

**And the Manufacture and Distribution of Coal Gas.**

Originally written by SAM'L HUGHES, C E.
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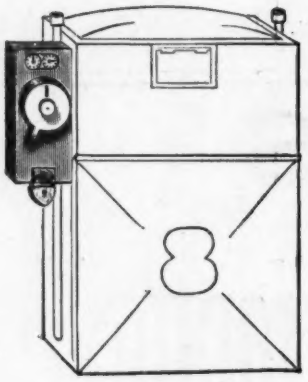

THE **REEVES PREPAYMENT ATTACHMENT**

HAS ADVANTAGES POSSESSED BY NO OTHER DEVICE OF THE KIND.

**FATAL ACCIDENTS** CAUSED BY

CONSUMERS PUTTING COIN IN METER AND SO TURNING GAS ON IN SLEEPING ROOMS WHERE IT HAD GONE OUT **CANNOT OCCUR** WITH THE **REEVES**, AS THE LIGHT DROPS TO A VERY SMALL ONE, BUT DOES NOT GO OUT FOR 10 OR MORE HOURS, AND AMOUNT OF GAS SO USED IS AUTOMATICALLY DEDUCTED FROM NEXT PREPAY. HAS OTHER GREAT ADVANTAGES. FITTED TO ANY MAKE OF METER. $10 CAN BE PREPAID AT ONE TIME. DEVICE CANNOT BE "**BEATEN.**"

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Of Uniform Excellence and Greatest Candle Power.

BEWARE OF IMITATIONS.

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SOLE AGENTS FOR UNITED STATES.

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A WHEELBARROW WITH A CARRYING CAPACITY OF 250 POUNDS WOULD HAVE TO MAKE EIGHT TRIPS TO HANDLE THE AMOUNT OF COAL WHICH A CHARGING CAR CARRIES AT ONE TIME, NAMELY, 2,000 POUNDS, AND LESS EFFORT IS REQUIRED TO MOVE THE CAR WITH ITS TON LOAD THAN THE WHEELBARROW WITH ITS 250-POUND LOAD.

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## Cox's High Pressure Fluid Discharge Computer.

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,

$p_1$ = absolute initial pressure in pounds per square inch,

$p_2$ = absolute terminal pressure in pounds per square inch,

L = length of pipe in miles,

w = specific gravity of the fluid when air = 1.

**To Find the Discharge from a Pipe and the Required Size of Pipe.**

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

(4.) Opposite any desired discharge will also be found the required diameter of pipe.

**Price of the Computers, in Cloth Case, 6½ x 8 inches, $5 Each, Net.**

For Sale by

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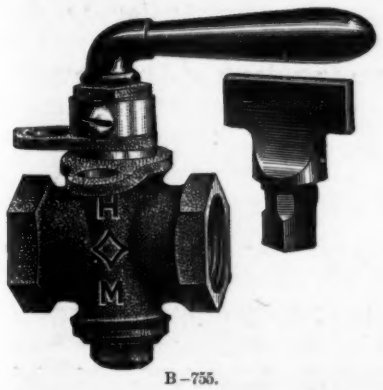
# Mueller Gas Cocks.



B-755.

TOO little is not as much as you pay for, and too much is more paid for than you need.

In **Mueller Gas Cocks** you find a happy medium--not so little metal as to leave them weak, nor yet so much as to make them costly.

Made in 145 styles, seven sizes in each style.

MADE ONLY BY

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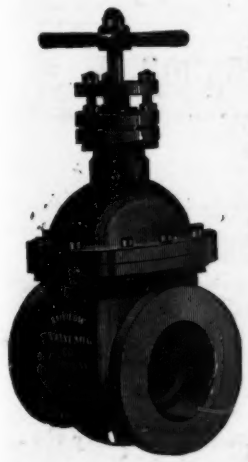
**Double and Single Gate Valves, ¼" to 72",**

—FOR—

**Gas, Water, Steam, Oil, Ammonia, Etc.**



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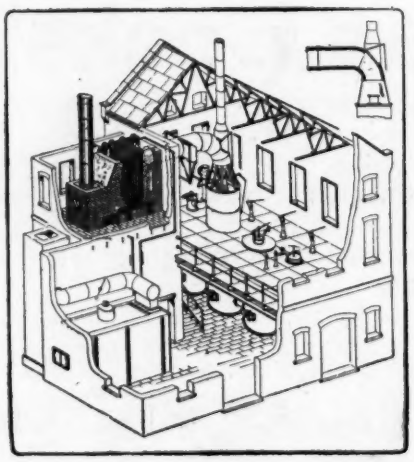
# Economize Heat in Water Gas Plants,

BY UTILIZING A

# Green's Economizer,



**To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :**

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

**GREEN FUEL ECONOMIZER CO.,**

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Plans prepared and Estimates furnished at short notice.

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**Chollar's System of Gas Purification.**

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

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**THE GAS ENGINEERS' POCKET-BOOK.**

**By Henry O'Connor,**

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

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WE are the Agents for the United States of the DRAKES' System of Benches, Inclined and Horizontal. These we erect on a guarantee that they will require not to exceed 12 pounds of fuel per 100 pounds of coal carbonized---in either Horizontal or Inclined benches.

This guarantee is not simply for a test, but for actual practice, and we guarantee the results for the year on that basis.

In the AMERICAN GAS LIGHT JOURNAL, issue of April 6, p. 548, the following figures were given as excellent results in actual practice:

### 8 BENCHES 6'S.

| | Coal Carbonized. Pounds. | Fuel Used. Pounds. | Fuel Used per Ton of Coal Carbonized. Pounds. | Per 100 Pounds of Coal Carbonized. Pounds. |
|---|---|---|---|---|
| October | 2,663,060 | Coal . 430,000<br>Coke . 11,000 | 331 | 16.55 |
| November | 2,668,867 | Coal . 405,290 | 303 | 15 01 |
| December | 2,879,810 | " . 444,000 | 308 | 15.04 |
| January | 2,905,510 | " . 446,150 | 307 | 15.03 |
| February. | 2,630,580 | " . 393,100 | 298 | 14.90 |
| | 13,747,827 | 2,129,540 | Average 309 | Average 15.49 |

This figures out at 15.49 pounds of fuel per 100 pounds of coal carbonized. With benches using the DRAKES' furnace the amount of fuel required would have been less than 1,648,536 pounds, or not to exceed 12 pounds per 100 pounds of coal carbonized---a saving of 481,004 pounds, or over 240 tons in 5 months' running. These benches are in operation in over 200 gas works.

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"Globe" Specials, Valves, Etc. "Flanorgan" Fire Hydrants

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Also, FLANGE PIPE, LAMP POSTS, Etc.

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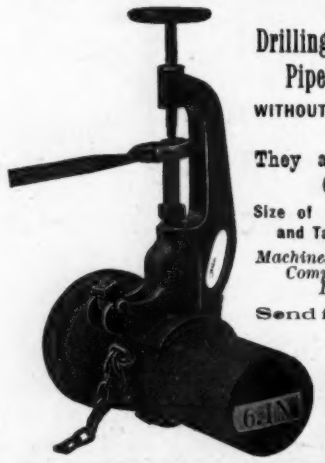
**GAS TAPPING MACHINES**

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.



They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

*Machines Sent to any Gas Company for Thirty Days' Trial.*

Send for Circulars

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**THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,**

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**Valuation of Gas, Electricity and Water Works**

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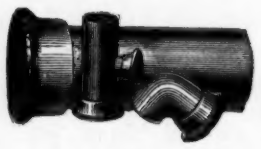

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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

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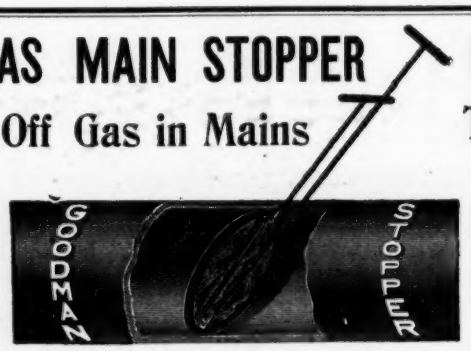
Temporarily during alterations and repairs. : : : :

Any size gas main can be shut off in 30 seconds. : : :

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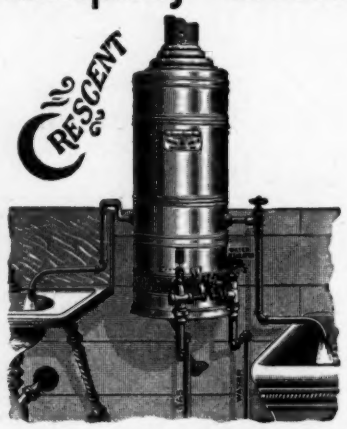
**Humphrey Crescent Instantaneous Water Heater**

IS A QUICK SELLER.

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**$20.00.**

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HAS NO EQUAL AT THE PRICE.

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HAVE YOU OUR CATALOGUE?

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**Parson's Steam Blower**

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

**PARSON'S TAR BURNER,**

FOR USING COAL TAR AS FUEL.

**PARSON'S AIR JET TUBE CLEANER,**

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y.

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# AMERICAN METER CO.

ESTABLISHED 1836. INCORPORATED 1862.

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CHICAGO,
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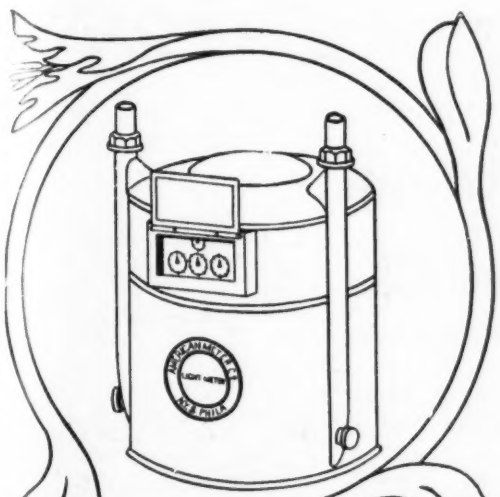
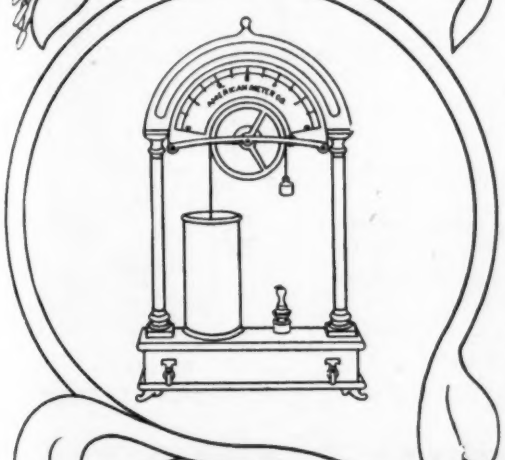
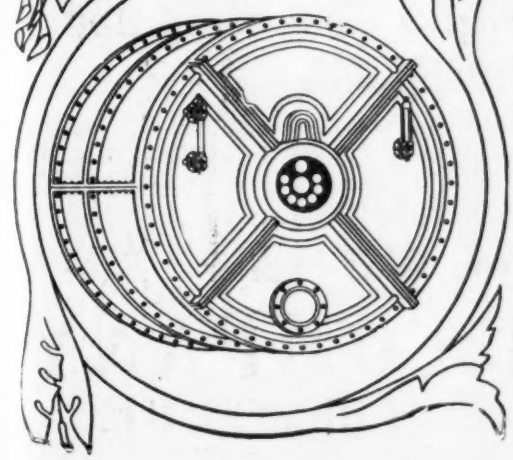






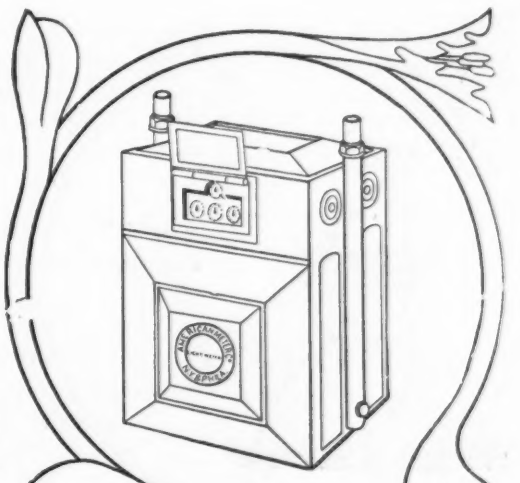
## PUBLIC LIGHTING TABLE.

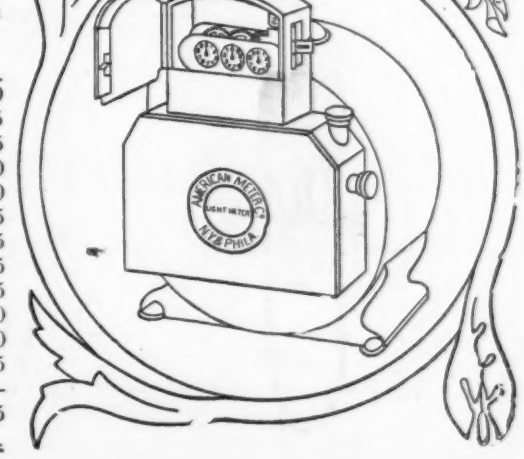
### MAY, 1903.

| Day of Week. | Date. | Table No. 1. Following the Moon. Light. | Extinguish. | Table No. 2. New York City. All Night Lighting. Light. | Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Fri. | 1 | 7.20 PM | 4.10 AM | 6.45 | 4.00 |
| Sat. | 2 | 11.10 | 4.10 | 6.45 | 4.00 |
| Sun. | 3 | 11.50 FQ | 4.00 | 6.45 | 4.00 |
| Mon. | 4 | 12.30 AM | 4.00 | 6.45 | 4.00 |
| Tue. | 5 | 1.10 | 4.00 | 6.45 | 4.00 |
| Wed. | 6 | 1.40 | 4.00 | 6.45 | 4.00 |
| Thu. | 7 | 2.10 | 4.00 | 6.55 | 3.40 |
| Fri. | 8 | 2.50 | 4.00 | 6.55 | 3.40 |
| Sat. | 9 | 3.20 | 4.00 | 6.55 | 3.40 |
| Sun. | 10 | No L. | No L. | 6.55 | 3.40 |
| Mon. | 11 | No L. FM | No L. | 6.55 | 3.40 |
| Tue. | 12 | No L. | No L. | 6,55 | 3.40 |
| Wed. | 13 | 7.30 PM | 10.00 PM | 6,55 | 3.40 |
| Thu. | 14 | 7.30 | 10.50 | 7.00 | 3.30 |
| Fri. | 15 | 7.30 | 11.40 | 7.00 | 3.30 |
| Sat. | 16 | 7.30 | 12.10 AM | 7.00 | 3.30 |
| Sun. | 17 | 7.40 | 12.50 | 7.00 | 3.30 |
| Mon. | 18 | 7.40 | 1.20 | 7.00 | 3.30 |
| Tue. | 19 | 7.40 LQ | 2.00 | 7.00 | 3.30 |
| Wed. | 20 | 7.40 | 2.30 | 7.00 | 3.30 |
| Thu. | 21 | 7.40 | 3.00 | 7.10 | 3.15 |
| Fri. | 22 | 7.40 | 3.30 | 7.10 | 3.15 |
| Sat. | 23 | 7.40 | 3.40 | 7.10 | 3.15 |
| Sun. | 24 | 7.50 | 3.40 | 7.10 | 3.15 |
| Mon. | 25 | 7.50 | 3.40 | 7.10 | 3.15 |
| Tue. | 26 | 7.50 NM | 3.40 | 7.10 | 3.15 |
| Wed. | 27 | 7.50 | 3.40 | 7.10 | 3.15 |
| Thu. | 28 | 7.50 | 3.40 | 7.15 | 3.15 |
| Fri. | 29 | 7.50 | 3.40 | 7.15 | 3.15 |
| Sat. | 30 | 7.50 | 3.40 | 7.15 | 3.15 |
| Sun. | 31 | 10.30 | 3.30 | 7.15 | 3.15 |

## TOTAL HOURS LIGHTING DURING 1903.

| By Table No. 1. | Hrs. Min. | By Table No. 2. | Hrs. Min. |
|---|---|---|---|
| January | 245.00 | January | 423.20 |
| February | 192.00 | February | 355.25 |
| March | 201.00 | March | 355.35 |
| April | 167.20 | April | 298.50 |
| May | 152.00 | May | 264.50 |
| June | 131.00 | June | 234.25 |
| July | 140.40 | July | 243.45 |
| August | 156.20 | August | 280.25 |
| September | 171.20 | September | 321.15 |
| October | 198.20 | October | 374.30 |
| November | 216.30 | November | 401.40 |
| December | 232.10 | December | 433.45 |
| Total, yr. | 2203.40 | Total, yr. | 3987.45 |

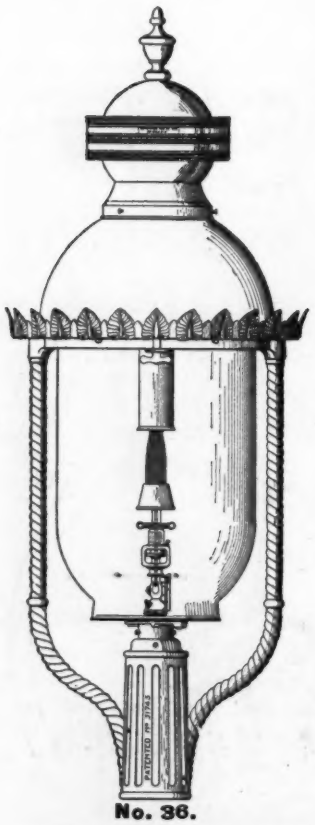




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

# WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

## Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.

No. 98.

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Here's what it would show if you give it a chance to prove its worth:

1. A mechanical construction and finish that insures the greatest durability.
2. The renewal of mantles and the cleaning of globes without removal of globe.
3. The greatest amount of candle power with least consumption of gas.
4. A by-pass cock so constructed as to permit all or only one mantle burning at a time.
5. A pilot light that consumes but 1 foot of gas in 24 hours. Costs $\frac{1}{10}$ of a cent a day.

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Let us send you one lamp—doesn't cost a fortune—and it will answer every question you put to it; make good on every test given it. You know the only proof of the pudding? What's the use in a fellow telling you it tastes good? Taste it yourself, then you know.

**May we Send you ONE Lamp?**

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**During the Year 1902 has been Awarded Contracts in the Following Places for**

## Standard Double-Superheater Lowe Water Gas Apparatus.

| | | |
|---|---|---|
| Atlantic City, N. J. | Flushing, N. Y. | Norristown, Pa. |
| Ardmore, Pa. | Hollidaysburg, Pa. | Norwalk, O. |
| Auburn, N. Y. | Houston, Tex. | Ocean City, N. J. |
| Belmar, N. J. | Indianapolis, Ind. | Oklahoma City, O. T. |
| Blue Island, Ills. | Jersey City, N. J. | Oneonta, N. Y. |
| Boonton, N. J. | Laconia, N. H. | Plainfield, N. J. |
| Brooklyn, N. Y. | Lakewood, N. J. | Portland, Me. |
| Carlisle, Pa. | La-Salle-Peru, Ills. | Pottsville, Pa. |
| Champaign, Ills. | Martinsville, Ind. | Scranton, Pa. |
| Coney Island, N. Y. | Memphis, Tenn. | South Brooklyn, N. Y. |
| Dallas, Tex. | Newark, N. J. | Suffern, N. Y. |
| Danville, Ills. | New Brunswick, N. J. | Swedesboro, N. J. |
| Des Moines, Ia. | New London, Conn. | Syracuse, N. Y. |
| Evanston, Ills. | New Orleans, La. | Washington, N. C. |
| Evansville, Ind. | Norfolk, Va. | Woonsocket, R. I. |

TOTAL SETS, 1902, . . . . . 51
TOTAL DAILY CAPACITY, 1902, . . 32,825,000 cubic feet.
TOTAL SETS TO DATE, . . . . . 447
TOTAL DAILY CAPACITY, . . . . 299,670,000 cubic feet.

## The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
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**J. H. Gautier & Co.**

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Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

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FIRE BRICK AND CLAY RETORTS
SPECIAL SHAPES TO ORDER

DETROIT CITY GAS COMPANY,
Detroit, Mich., 3–26–1903.

Mr. Oscar B. Weber,
Care Adam Weber Sons,
Park Row Building,
New York, N. Y.:

Dear Sir: The carbonizing and fuel results of the eight benches of 6's erected by you in 1902 at our station "B" are as follows:

| Coal Carbonized. Pounds. | Fuel Used. Pounds. | Fuel Used per Ton Coal Carbonized. Pounds. |
|---|---|---|
| Oct., 2,663,060 | Coal, 430,000 / Coke, 11,000 | 331 |
| Nov., 2,668,867 | Coal, 405,290 | 303 |
| Dec., 2,879,810 | " 444,000 | 308 |
| Jan., 2,905,510 | " 446,150 | 307 |
| Feb., 2,630,580 | " 393,100 | 298 |

I consider these bench fuel results excellent and fully equal to my expectations. The firebrick material and the workmanship on the benches I consider first-class and high grade in every respect. Very truly yours,

(Signed) PAUL DOTY,
GENERAL MANAGER.

NOTE.—Retorts 14 inches by 25 inches by 9 feet 6 inches.

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(ESTABLISHED 1856.)

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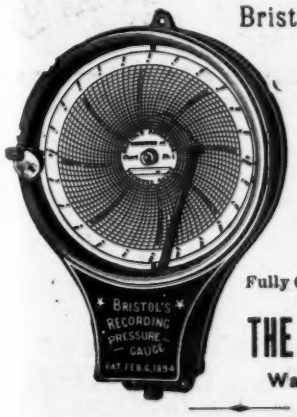


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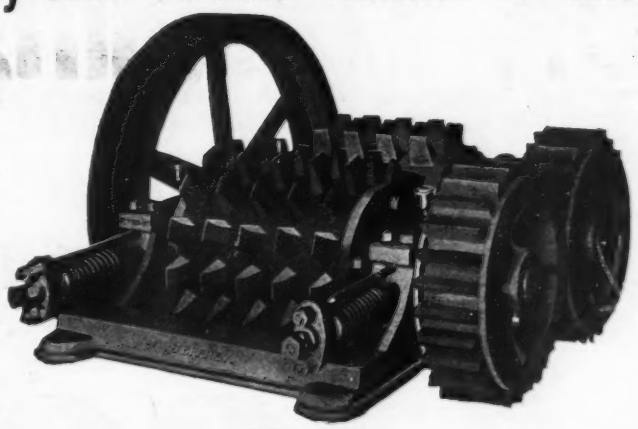

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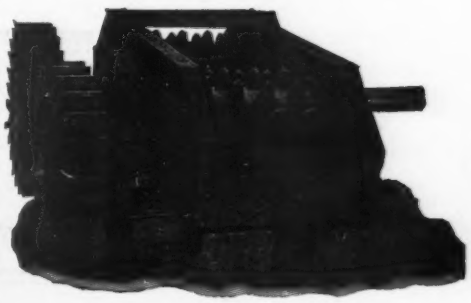

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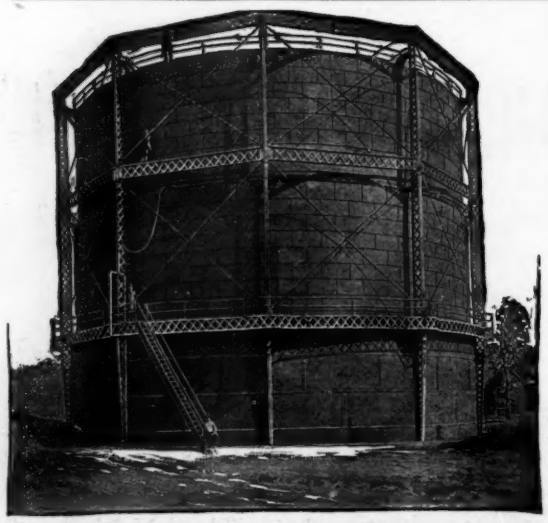

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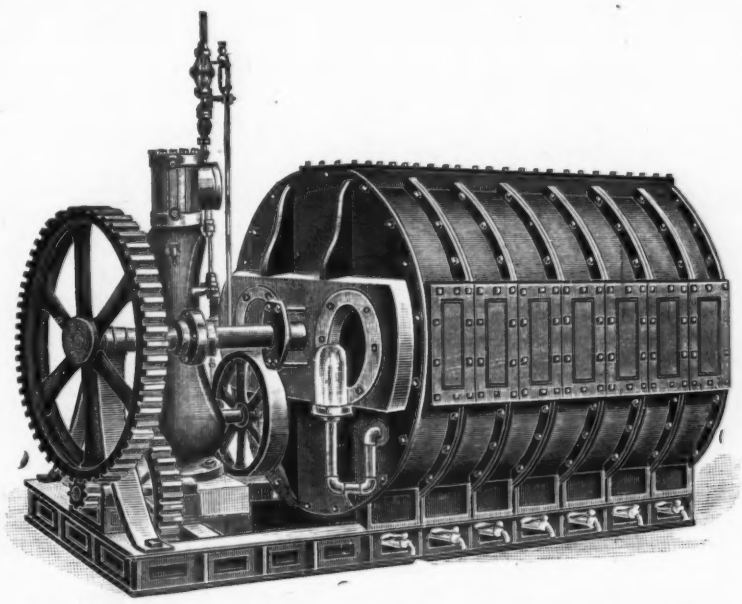

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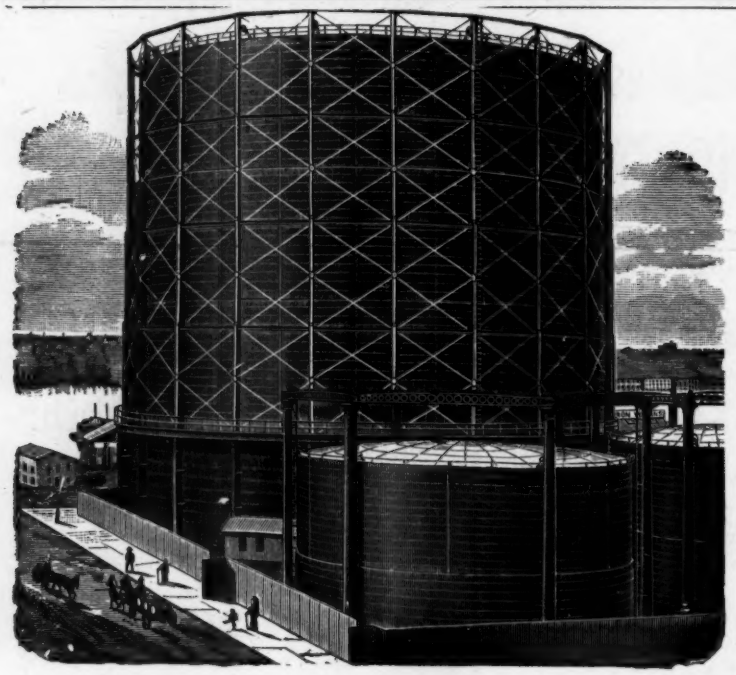

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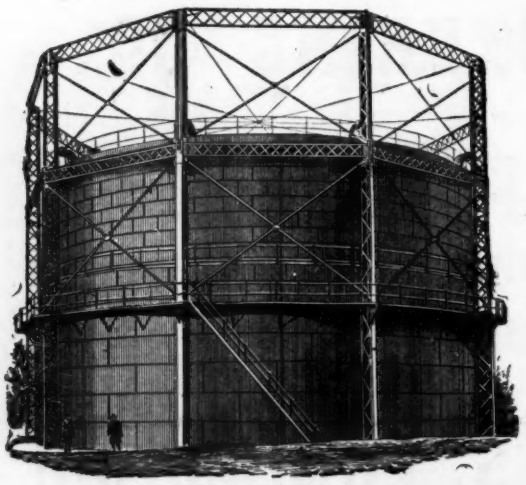

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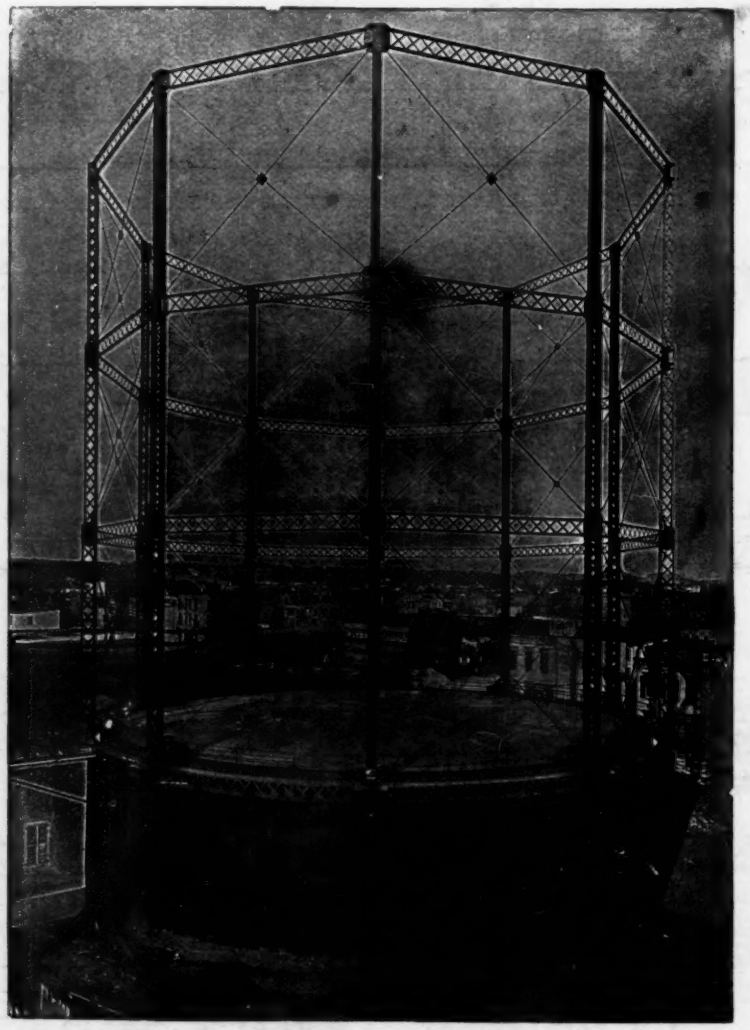

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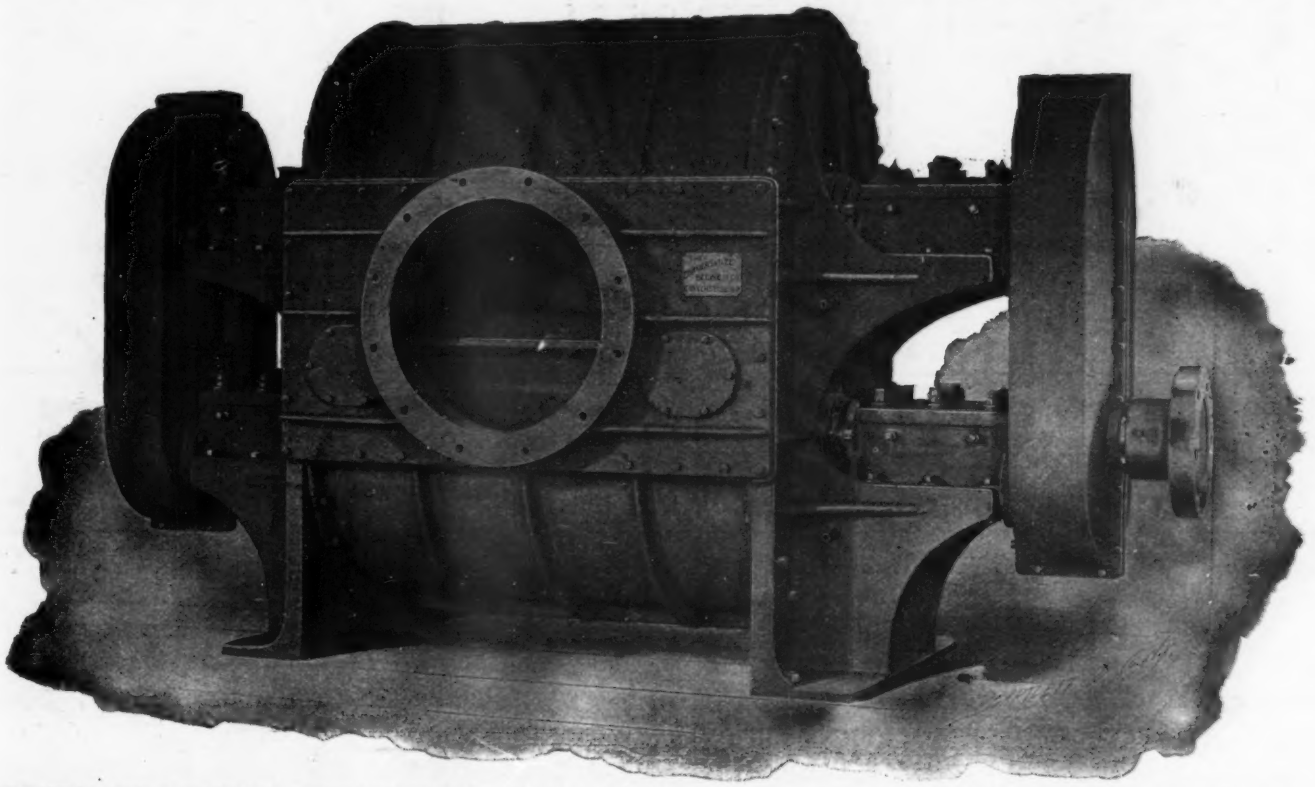

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